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The Farmer's Digest

Volume 7 November, 1943 Number 6

Dairy Farming with Sawdust

Condensed from American Forests

D. W. Geesaman and T. G. Norris

THOUSANDS of tons of waste sawdust can be put to work producing food for the war effort. The procedure is simple, if you own a dairy farm, and inexpensive.

Most farmers, of course, know that sawdust is acid, and that its extensive use as a fertilizer will sour the soil. Either oak or pine sawdust, used alone, will discourage the growth of any leguminous farm crop. But add to that sawdust the urine of cattle and it becomes slightly alkaline. Such alkaline sawdust, or manure, is highly desirable for farm use. If you are interested in the chemical aspect, raw oak sawdust will test about ph 4.5, pine sawdust ph 5.5. After use in a dairy barn, the same sawdust will test ph 7.0 or 7.5, or slightly on the alkaline side.

An outstanding example of the use of wood waste in dairy farming is that of Wilbur F. Barkdoll of Mont Alto, Pennsylvania. This farmer, in 1915, purchased an eighty-eight acre tract in Franklin County. Sixty-three acres were of stony loam, the remainder mostly limestone—underlaid with limestone silt subsoil. Today, this would be called a marginal farm; in 1915 it was a "bumble-bee patch."

Although the house and barn were in fair condition, the barn floor was merely dirt and the barnyard little more than a hole in the ground. Several hundred loads of stone, part of it crushed, restored the barnyard, and a concrete floor was placed in the barn. This floor was unique in that there were no drains in the gutters back of the cow stalls.

From the beginning, sawdust and wood shavings have been used as bedding and as an absorbing medium in the main dairy barn. Since no drains are available, all moisture is absorbed by the mill waste, producing a manure exceptionally rich in plant

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food. Since wood wastes have a higher absorbing capacity than straw, the gutters are cleaned twice daily and the manure hauled out and spread on the fields.

When purchased, the fertility of the Barkdoll farm was low. The first crop of hay produced but six loads; wheat production was fifteen bushels an acre, corn seventy-five bushels. What has happened to the soil since this first crop can best be pictured by looking at the farm as it exists today. The barn and house have been modernized; outbuildings have been improved; a new milk cooling house has been erected, and equipment installed; a workshop for overhauling farm machinery has been built; and portable electric fences regulate the pasturing of cattle. You don't do these things on land of low fertility.

Yields since 1915 have been as high as forty-five bushels of wheat an acre, or three times the yield of the first crop; corn, 198 bushels an acre, or two and a half times the 1915 crop. But listen to this: the hay crop is twenty-two times greater, or 131 four-horse loads. Examining sample cuttings from Mr. Barkdoll's five-year-old field of alfalfa, orchard grass and ladino clover, J. H. Knode, county agent, had this to report last September:

"Reducing this thirty-two tons an acre of green hay to a dry basis at the rate of seventy-five per cent moisture in the green hay and twenty per cent moisture in the dried hay, the yield is twenty tons and twenty pounds of dry hay, which I believe constitutes a record for this section of the state."

The animal units on this farm are six horses, forty milk cows, one bull, eighteen heifers, and seventy-five chickens. The maintenance of fifty-nine head of cattle and six horses on a farm, which at the time of purchase would scarcely provide hay and pasture for less than one-third that number is, in brief, an accomplishment that has won for Mr. Barkdoll the distinguished recognition as a Master Farmer, an honor conferred by the *Pennsylvania Farmer*.

Some of the materials used in improving the land were hydrated lime and marl, and when the quarry where marl was purchased ceased operating, pulverized limestone was used. For a number of years a complete 2-12-6 fertilizer was used at the rate of 250 pounds an acre. Recently, 200 pounds an acre of twenty per cent superphosphate has been drilled into the corn ground. The same quantity is also applied to wheat and to alfalfa at the time of seeding. Manure is applied to all grass after grain is removed, and is also applied to the alfalfa.

As a matter of fact, there is seldom a day during the entire year that manure is not hauled to the fields and spread. In 1938 there were 710 spreader loads, or between nine and ten tons an acre a year.

Since the amount and quality of manure is the deciding factor in producing bumper crops, it may be of interest to see how it is obtained. As has been mentioned, the barn floor is of concrete and so constructed that all liquids flow into the gutters in the rear of the cows. After the gutters are cleaned, which is done morning and evening, several inches of wood wastes are placed in them. The alley-way between the gutters is covered with about one inch of shavings or sawdust, and the cows are bedded with several inches of the same material. Much of this is regularly swept into the gutters to absorb all body liquid. This manure is then shoveled into a litter carrier and taken directly to the spreader. When half a load is thus obtained, fifty pounds of superphosphate is scattered over the manure and the spreader then filled. The phosphate so placed is readily available as plant food.

Another theory proved in a quarter of a century on this farm is that liberal use of limestone dust or marl, together with a bountiful supply of sawdust manure, and this coupled with commercial fertilizer, produces roughage that contains all the minerals required by cattle for good health and vigor. Too, these minerals are in a form most readily assimilated by the animals.

In the production of manure at the Barkdoll farm, six tons of wood wastes are required each week in winter when the cattle are stabled, and three tons each summer week when the cattle are in pasture a good part of the day. Not less than 250 tons of wood wastes have gone on this land each year for the last quarter century. Thus, at the rate of three tons of wood wastes an acre a year over a period of twenty-five years, 6,250 tons have been used on the farm, a total of seventy-five tons an acre. These wastes disintegrate quickly and no chunks or shavings are turned up when the land is plowed.

Mr. Barkdoll maintains a truck with a large body for the express purpose of hauling sawdust and shavings from local mills. Most of this material is obtained without cost as local operators are usually glad to get rid of it. A mill within a mile of the Barkdoll farm supplies about five per cent of total requirements. The remainder comes from mills on Pennsylvania state forests and small woodlot operations within a radius of twenty miles. The sawdust from the state forests, mostly mountainous country, is chiefly pitch pine, that from the farm

woodlots oak. Accessibility and shortness of haul, rather than acid content, are the factors which determine which sawdust pile will be used.

The use of wood wastes on dairy farms releases many acres that otherwise would have to be used to produce grain crops and straw for bedding. These released acres can be used in producing food crops and, in turn, more cattle can be raised for each acre of farm land under cultivation. Since wood wastes are considered at Barkdoll farm as superior to straw, and as straw is quoted on the local grain market at fifteen dollars a ton, a saving was made this past year of more than $3,750 in straw alone.

Wood wastes are used on this farm so that crops are grown profitably and they, in turn, produce sturdy, healthy cattle that make milk profitable, and, consequently, round out a farming program that can well be studied by foresters, farmers and woodland owners alike for the benefit of all concerned.

Grain Drying

A new and simple method for drying batches of damp grain has been developed, based on the successful drying of coffee beans in South American countries. To make a bed for thin layers of grain, a 13½-foot width of reinforced, waterproof paper is laid over strips of snow fence which have been lathed together. Grain is thus exposed to the drying action of sun and wind in layers of from two to three inches deep. Should wet weather develop, both ends of the drying strip are pulled to the middle, the paper being used as a waterproofing cover with the fence holding it in position. Still experimental, results to date with this method promise the drying of batches of 100 to 150 bushels of grain within a day at most. Such a method should allow for handling grain combined early in the mornings or for the drying of grain already binned but heating.—Sisalkraft.

How to Prolong the Life of Rubber

Condensed from Oakite News Service

STOCK piles of natural rubber built up in this country must be employed to make tires for jeeps and peeps, for gun carriages and planes—for war plant transmission and conveyor belts. A battleship uses miles of rubber insulated electric wiring, and the signal corps of the Army requires vast amounts. A gas mask contains a pound and a half of rubber, and an eight-wheeled 4.7 inch motorized anti-aircraft gun uses 2,242 pounds of crude rubber, enough for 45 passenger cars. When you add to this the ton and a half of rubber that goes into a single tank, the tremendous amounts needed for barrage balloons, rubber boats, and the hundreds of other ordnance items, you can see that there will be precious little of our irreplaceable rubber supply available for civilian use. We will have to stretch the life of our rubber articles to the very limit—or do without.

How can we prolong the life of rubber? Careful handling is the first consideration. Abrasion destroys rubber as it does everything else. Frictional wear can be cut down by checking all equipment over which rubber travels or which it touches, and making needed adjustments. Hose should not be dragged around corners or over sharp edges. Never cut the flow of water through a hose by kinking it. Never allow vehicles to run over hose.

Heavy overloads on tires and belts cause strains that break down rubber and fabric. Although capacity to stretch and return to shape is the most valuable property of rubber, it must be remembered that a rubber article which is kept under constant tension is much more susceptible to deterioration than the same rubber article at rest. For example, a hose if closed at the end and constantly full of water or air at high pressure, will have only a fraction of the life of a similar piece of hose that is used intermittently. If reasonable precautions are taken, the life of rubber goods can be definitely prolonged.

Exposure to sunlight deteriorates natural rubber rapidly and is a frequent cause of breakdowns. Therefore it is important that all rubber products—hose, belts, tires, clothing, etc.—be protected from the sun's rays wherever possible.

Lastly, *and most important, oil, gasoline, grease, and other products with a petroleum or*

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vegetable oil content, are harmful to rubber. These materials destroy rubber by penetrating into it, by rotting it, causing it to swell and lose its elasticity.

This can be proven by a simple experiment. Soak a rubber band in a glass of kerosene or benzine for a few hours. The rubber band will swell to several times its original size. Stretch it and it will break easily. The rubber has been rendered completely useless. Oil and grease have a similar action on rubber, though deterioration is not so rapid as with solvents. Therefore, whenever possible to avoid it, oils and greases should not be permitted to come in contact with rubber; if it does happen, the rubber should be cleaned and washed as quickly as possible.

In most cases, cleaning procedures are simple. Hose of all types can be brushed or wiped with the cleaning solution and then rinsed. Wherever possible, keep hose on a reel when not in use. Rubber mats, boots, clothing, etc., can be cleaned in the same manner. A good thing to remember is to clean as soon as possible after contamination.

Conveyor belts have made possible tremendous savings to industry in the economical handling of materials. Given reasonable care, they can last indefinitely. Belts do not wear out carrying the load along the straightway, if idlers are in good condition and properly spaced. Principal wear occurs at the loading points. If frequent breaks and tears occur, the loading chute may be at fault. Small breaks and tears should be vulcanized. A portable patch vulcanizer is now available for this work. Above all, wash belts frequently. Keep them free of grease, oil and animal fats. Moisture from fruit and vegetable juices can penetrate the belt and get into the fabric, causing rotting and mildew.

V belts and other transmission belting can be made to last longer if given proper care. Check alignment and tension periodically, and keep sheaves and belts free from grease and oil. Hard rubber tires on industrial hand trucks should be given the same care as inflated tires. They are no tougher.

Rubber, metal and rubber, and rubber composition gaskets can be reconditioned if the rubber has not deteriorated. This type of rubber goods is usually made to withstand high heat and exposure to oils and greases, but periodic cleaning, during overhaul or repair, will restore them to good condition and lengthen their life.

Don't park cars in puddles of oil or grease, and never clean tires, fan belts, hose, etc., with gasoline or kerosene. There is no

quicker way of ruining them.

Milking machine sanitation has always been important from the standpoint of high milk quality. Now, the rubber shortage makes proper cleaning doubly important. Here is the correct procedure as given by one manufacturer: "Immediately after the milking is finished, plunge the inflations in cold water. Seconds count. Milk dries rapidly, forming milkstone which is hard to remove. As soon as possible thereafter, scrub the parts in hot water to which has been added a good alkali washing powder. *Never use soap.* If parts are immediately put in cold water, the milk will not dry, and prolonged scrubbing, which is hard on rubber, will not be necessary."

Some types of rubber equipment can be cleaned almost as fast as they become soiled. Where this is impossible, the next best thing is to put the cleaning on a regular, *and frequent,* schedule, for the principle of the cleaning procedure recommended above by the milking machine manufacturer, namely, to prevent foreign matter from remaining or drying on rubber articles, and to wash as soon as possible, is the correct one and can be applied to rubber parts and equipment in every field of American industry.

Shorn Lambs

Western range lambs clipped on October 10, 1942, to produce shearling pelts for aviators' suits, and then put into the fattening lot at the Minnesota Experiment Station, gained neither more nor less than lambs in full fleece. Shearing one lot of lambs in this experiment later—on November 19, when cold weather had set in—had no ill effects and gains were about the same as on other lambs. Both daily feed consumption and the cost of feed required to produce 100 pounds of gain were very close between shorn and the unshorn lambs, with the shorn lambs having only a slight advantage.

Feeding Synthetic Thyroprotein

Condensed from American Feed Trade

Charles W. Turner

Professor of Dairy Husbandry, University of Missouri

WHILE great advances have been made during the past few years in gaining an insight into the action of the endocrine glands and the hormones which they secrete, upon the important productive functions of our domestic animals, yet little practical application has been made due to the fact that most of these hormones must be injected to be of value. That is to say, when hormones are fed, they usually lose their activity in the digestive tract. However, there is one notable exception to this rule, i.e., the hormone of the thyroid gland. It was discovered more than 50 years ago that the thyroid gland could be dried, ground to a powder, and fed effectively in pellet or capsule form. This form of therapy has been used widely in clinical medicine with marvelous improvement effected when the normal thyroid secretion was insufficient.

The reason that the thyroid hormone could be fed became clear when its structure was recognized. In the natural condition, the hormone is attached to the protein, globulin. The active physiological agent is *thyroxine*, which is an amino acid closely related to tyrosine, one of the building blocks of which protein is formed. So when the thyroglobulin in the thyroid gland is fed, it is broken down into the constituent amino acids with the thyroxine ready to be absorbed into the blood and to perform its characteristic functions which will be described.

In an animal, the normal process is for the iodine which is fed to be carried to the thyroid gland and there concentrated. This iodine is then transformed in the gland by stages first into *diiodotyrosine*, i.e., the amino acid tyrosine takes up two atoms of iodine, and then two molecules of diiodotyrosine join to form thyroxine.

The important discovery that has been made by Dr. E. P. Reineke and the writer in the laboratory of the Department of Dairy Husbandry of the Missouri Agricultural Experiment Station is that the transformation

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of iodine into thyroxine in the form of a thyroprotein could be accomplished successfully in the test tube just as it is formed in the thyroid gland. Instead of starting with blood serum globulin (used by the thyroid gland), we have found that the milk protein—casein—is equally effective. To casein is added suitable amounts of iodine under very definitely controlled chemical conditions. The casein is gradually converted into a thyroactive iodocasein. This synthetic thyroprotein has been found to have four or more times the thyroid activity of natural desiccated thyroid gland which meets the U. S. P. standard. When in commercial production, this synthetic material should be produced at a rather low price in comparison with the natural product.

The question might be asked, "Why are dairymen interested in such a product?" The answer forms a rather interesting story of research with a successful conclusion. About 10 years ago Dr. W. R. Graham, Jr., as a student in the Ontario Agricultural College started to find out if the thyroid glands had any influence on milk secretion. In some cows he removed the thyroid; to others he fed thyroid gland tissue. He observed that the removal of the glands depressed milk secretion, while the feeding of thyroid gland tissue increased milk secretion. If he injected crystalline thyroxine there was a rapid increase in the milk yield and in the fat production as well, so long as the injections were continued.

These observations were confirmed and extended in research work at the Missouri Agricultural Experiment Station. When normal dairy cows in declining milk production were fed dried thyroid glands or were injected with thyroxine, the milk flow increased and the fat percentage increased as well. At the peak of production some cows did not respond by an increase but did maintain their production at a high level for several months, whereas without such treatment most cows begin a regular decline.

The thyroid hormone seemed to do two things which dairymen had long sought. 1. Stimulate the secretion of milk and increase the natural persistency of milk production. 2. Stimulate an increased fat percentage in the milk produced.

High protein feeds had once been thought to stimulate more milk, but during recent years their effectiveness has been questioned. Nothing which could be added to the feed had been shown to consistently increase the fat content of the milk. However, it is known that the test increases in the fall and winter and decreases in the spring and

summer. It is probable that this seasonal change is due also to the natural increase in the secretion of the thyroid gland during the fall and winter months.

The one difficulty in applying the discovery of the effectiveness of thyroid hormone upon milk secretion was the high cost of dried thyroid glands obtained from the packing plant or of thyroxine which could be synthesized in the chemical laboratory. Both substances were far too expensive to be used practically. It was to try to produce a cheap substitute for the thyroid secretion which caused us to take up the experimental work described. The product which was produced, a *synthetic thyroprotein,* appears to offer great promise as a stimulator of milk secretion. Preliminary practical tests are very encouraging. Much more work must be done with this product in trials to determine how long it will be effective. The immediate rise in milk production and increased fat percentage upon its addition to the ration of cows in advanced lactation is very effective in selling dairymen as to the value of this product. So long as the feeding is continued, production remains at about that level. If feeding is discontinued, there is a very perceptible decline in milk production within a week. So far there is less apparent value in this material when given to cows at their peak production; however, after feeding the material for several months and it is then withdrawn, the decline in production is marked and demonstrates the extent to which the hormone has been effective in maintaining the secretion of milk.

A commercial laboratory in Kansas City has begun the production of the synthetic thyroprotein for the larger experimental trials now in progress. It is hoped that this product will be approved by the U. S. Food and Drug Administration shortly so that synthetic thyroprotein may contribute to the urgent demand for more milk and fat production for our armed forces.

In addition to the value of thyroprotein in stimulating increased milk and fat production in dairy cattle, there are a number of other uses this may have. More research must be conducted to prove the effectiveness of thyroprotein for the uses suggested but work with experimental animals indicates it may be valuable.

In a certain percentage of cases of reproductive failure in both males and females, it has been shown that the thyroid gland is involved. The feeding of thyroid tissue in such cases has been beneficial. In cattle it would seem worthwhile for sterile cattle to be fed thyroprotein for several months before being discarded to

see if insufficient thyroid secretion were the cause of the trouble. This would be especially pertinent if the animals were overweight. Sluggish bulls have been observed to respond to thyroid. Their pep and activity increases within a few days after beginning feeding treatment. However, if the thyroid is the cause of poor semen production, it should be expected that several weeks would elapse before the condition of the semen would improve.

Preliminary work with poultry shows promise in thyroprotein as a stimulator of feather growth in chicks as well as body growth. It would appear that bare-back chicks could be caused to feather out with this material. Because it will cause chicks to feather out completely when six weeks old, thyroprotein might be useful especially with early chicks so as to withstand the cold of early spring.

The best egg production is obtained during the pullet year. Older hens gradually decline in egg production. It is known that the thyroid secretion declines with age. If this were one of the causes of the decline in egg production in older hens, it might be expected that thyroprotein feeding would increase the production of old hens. When year-old hens were fed thyroprotein starting in October last year, it increased the rate of moulting for a time and caused the hens to cease laying. With the new feather coat developed, the hens began to lay again and have far outstripped the control hens.

Grass That Saves Grain

A combination of alfalfa and brome grass is the best dairy pasture Thurston Powers ever used. At the Upjohn farm in Kalamazoo county, Michigan, where he is herdsman, 25 acres of the mixture carries 25 producing cows from May 15 to October 1. The pasture is so nutritious that many cows eat but half the grain which their production justifies.

Make the Grass Greener on Your Side of the Fence

William A. Albrecht

Chairman, Department of Soils, University of Missouri

THAT "the grass is greener on the other side of the fence" is more than bovine fancy. When the cow will risk injury from barbed wire in order to get out on the highway or into another field for the grass on the other side, there must be some compelling force responsible.

Perhaps you have never thought that animal instinct and soil fertility are at the basis of what may be wrongly considered as just so much "crazy cow" psychology. In this adage about animal behavior, there is given to us a significant suggestion for making our shortage of labor more effective and the farm business more profitable. Recent soil studies using animals as means of measuring soil fertility are pointing out that animal choices represent more effective gains by them, better animal health, along with more regular and more prolific reproduction.

Lime treatments on the soil, for example, are the areas commonly selected when cows graze lespedeza in one part of a field in preference to another, as numerous farmers testify. Hogging corn down has confined itself right to the line marking the limits within which lime was used on the soil. The corn was left untouched where no lime was used even though the hogs passed to and fro through it. Barley has been grazed out first where 200 pounds of fertilizer were applied in contrast to that with only 100 pounds. Grains, such as corn, in the self-feeder have been selected by hogs according to the soil treatment where the crop was grown. Guinea pigs have selected various grains with differences in choice according to the fertility of the soils growing them. Rats have selected bagged corn grain and cut into the bags according to the soil treatments, but did not select according to the different corn hybrids involved. Experimental rats, according to the work of Dr. Curt Richter of Johns Hopkins Hospital, refused to eat fat when they were surgically op-

erated so that they couldn't deliver bile for fat digestion. They refused to eat sugar if their body supply of insulin for consuming sugar was diverted. They ate more sugar, too, according to the dosage of insulin given them to encourage sugar metabolism in the body. There is then a real physiological basis within the plant to explain possibly why the animal appetite reports different food choices according to differences in the soil.

Yes "the other side of the fence" is sought by the animal because of its better judgment as to its nourishment, and therefore its better health, better growth, and more efficient reproduction are involved. The cows usually break out on to the highway or railroad right-of-way where crops have grown annually but have not been removed. Crops have not carried away the soil fertility. We have been alarmed about the danger that some valuable meat or milk producer might be killed by traffic. Instead, we should be recognizing the fact that by means of the more fertile soil on the other side of the fence our efforts and the animal's time can be used more effectively in making food.

The fall season has usually been a convenient time for liming plowed soil, particularly where small grains are fall-seeded to be followed by legumes. In case you have hesitated about liming now, why not take the efficiency of the animal production business into consideration? Soil treatments are means of increasing the animal's efficiency with no extra labor on your part. Sheep run a better wool-making business if the soil is more fertile. Animals can grow sounder bones and bigger bodies, all during the same time on the same amount of feed. Why not look to the soil fertility improvement by means of the calcium that you can put into the soil to set in motion this improved animal efficiency?

Liming is beneficial because it helps both the plants and the animals to get their needed calcium, more than because this soil treatment fights soil acidity. Calcium in limestone, or even in gypsum; phosphorus in the acid, or raw rock forms; potassium as salts; and all the other nutrient elements included on the soil fertility list, need our attention as soil treatments to make the grass greener on our own side of the fence as the cow really sees it. The cows have been pleading with us, but we have turned them a deaf ear. We may well profit by using these animal assays of our soil fertility as well as by calling on the chemist for soil tests.

Soil nutrients are but 5 per cent in the crop. The remaining 95 per cent are air, water, and sunshine. These plentiful weath-

er-given nutrients will not be fabricated into food for the cow, neither will the crop nor the cow manufacture food for use unless we provide an ample supply of fertility in the soil on which the big business of outdoor chemical synthesis known as agriculture depends. We can improve the efficiency of our own efforts; we can help ourselves to more and better food when we appreciate the better soil fertility connected with the cow's psychology fully enough to make the grass greener on our side of the fence by improving the fertility of the soil located there.

There are 3 to 4 loads of manure to spread every week day at the 4 farms in Wayne county, Indiana, where Omer F. Smith handles 10,000 laying hens. Smith bought a new spreader minus wheels and axles, and mounted it on the chassis of an old 1928 truck. To adapt the chassis to the large spreader, it was necessary to remove the rear springs, lengthen the drive shaft and the frame. The latter was accomplished by extending the original frame with hardwood timbers. The truck engine supplies power for operating the spreader machinery.

A hitch was made so a 4-wheel trailer may be towed behind the spreader. The man who cleans range houses loads the trailer with clean litter and drives from house to house throwing old litter into the spreader and replacing it with new from the trailer. Chains on rear wheels give the rig power enough to move range houses. Spreader and trailer, piled high with coops, make many trips between range and the various farmsteads in moving chicks out and back. It also serves as a fence-building vehicle.

How Much Grain Should a Cow Be Fed?

Condensed from American Dairyman

A. A. Borland
Pennsylvania State College

IF one were asked, "How much grain should a cow be fed," he might reply, "A cow ought to be fed the amount of grain that will return her owner the greatest net profit."

Naturally there are several factors entering into the specific answer to this question. They include the relative prices of grain and milk, the ability of the cow to convert feed into milk, and the effects of increased grain feeding upon the health, the reproductive ability and the longevity of the cow.

In order to secure some first hand information on this problem the U. S. Bureaus of Agricultural Economics and Dairy Industry in cooperation with ten State Agricultural Experiment Stations recently completed an extensive study of the relation of grain feeding to milk production in dairy cows.

Some of the phases of this study at The Pennsylvania State College will be of considerable interest to many dairy cattle breeders.

Six different groups of Holstein and Brown Swiss cows were all fed similar amounts of roughage (8 pounds of alfalfa hay and 40 pounds of corn silage per 1000 pounds of liveweight) but were fed grain in varying amounts in relation to their milk production requirements based upon the Haecker Feeding Standard. These levels of grain feeding were 70, 80, 90, 100, 110, and 120 per cent of the allowance prescribed by the Standard. The grain mixture contained 14 per cent crude protein, 11 per cent digestible protein and 70 per cent total digestible nutrients and was continued for two full lactation periods.

After two complete lactations the results indicated that the cows on the highest levels of feeding had not yet reached the point where additional grain would not bring additional yields of milk. It was therefore decided to feed a group of 22 Holstein and Brown Swiss all the grain they would eat during the following lactation in order to see what would happen at the upper limits of grain consumption. This group ate grain on the average at the rate of 123.1 per cent of the Standard Haecker allowance, or at the rate of one pound of grain

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to 1.75 pounds of milk. Some of the cows in this group had been on the 120 per cent level of grain feeding the two previous lactations, hence they were fed unusually liberal amounts of grain for three lactations in succession.

The average daily grain consumption for this unlimited group during the lactation year was 24.6 pounds. In the peak of milk production some cows readily ate 35 or more pounds of grain daily, the highest grain consumption being 39 pounds. In feeding grain, the allowance was gradually increased so that the cows were on full feed in two or three weeks after freshening, the exact length of time being dependent upon the appetite and condition of the individual cow. It would appear that these cows had good common sense, since they of their own accord restricted their consumption of grain to what they could utilize for milk production. Of the 22 cows on unlimited grain feeding 4 would consume no more than 15 per cent above the Haecker Standard for milk production. Eleven ate from 15 to 30 per cent above the Standard allowance and 7 ate more than 30 per cent above the Standard. The largest feed consumer among the 22 cows ate 47.1 per cent more grain than the Standard Haecker allowance for milk production during the year. The average milk yield was 47 pounds per day with a number of cows producing 80 to 85 pounds during the peak of production, the highest daily yield being 89 pounds.

The yields of milk at these various levels of grain feeding and the milk yield per pound of grain fed may be noted from the following table.

It will be evident that in general an increase in the amount of grain brings a substantial increase in the yield of milk. The cows fed grain at 120 per cent levels produced about 50 per cent more milk than those fed grain at 70 to 80 per cent of a normal Haecker allowance.

Table 1—Relation of Grain Consumption to Milk Production

Level of Grain Feeding Based Upon Haecker's Standard per cent	Yearly Records number	Grain Consumed During Lactation pounds	Alfalfa Hay Consumed During Lactation pounds	Silage Consumed During Lactation pounds	Milk Produced (4 per cent fat corrected basis) pounds	Milk Yield Per Pound of Grain Fed ratio
70	2	1511	3185	17538	7993	1:5.3
80	10	2248	3245	17000	8816	1:3.9
90	9	3455	3059	15947	10253	1:3.0
100	9	4221	3414	18468	11518	1:2.7
110	10	4751	3320	15774	10879	1:2.3
120	4	6221	3311	14679	12170	1:2.0
Unlimited (123.1)	22	7300	3586	11882	12756	1:1.75

However, it may be noted that the law of diminishing returns operates as the grain allowance increases. At the 80 per cent level one pound of grain returned 3.9 pounds of milk while at the 120 per cent level one pound of grain returned 2.0 pounds of milk, and with unlimited grain consumption (123.1 per cent level) one pound of grain resulted in 1.75 pounds of milk.

Whether the increased yields of milk from additional grain are profitable will depend upon the relative prices of grain and milk, as will later be shown. On the average the most profitable rate of grain feeding for cows having a productive capacity of 7500 pounds of 4 per cent fat corrected milk per lactation year was found under the conditions of this experiment to be one pound of grain for 3.3 pounds of milk, when the price of milk was $2.60 per 100 pounds, hay $15 a ton, silage $5 a ton and grain $30 a ton. For cows having a productive capacity of 10,000 pounds of 4 per cent fat corrected milk the most profitable rate of grain feeding was found to be one pound of grain to 3 pounds of milk. With milk prices higher than $2.60 per 100 pounds it would have been desirable to feed even the lower producing cows at the higher level of grain feeding.

No significant differences in health, well being, or breeding efficiency were noted among the various groups. The cows fed at the highest grain levels kept in somewhat better condition of flesh than those at the lower levels. The lowest level group lost slightly in weight (approximately 2 per cent) during the two year period whereas the three highest level groups gained slightly (3 to 5 per cent). It was also observed that the weights tended to become stabilized during the second year of the experiment.

All cows and groups of cows were treated alike. None received any special pampering. While the herd was under the care of a competent herdsman, yet any experienced dairyman, of good common sense, could have handled the herd equally well.

The financial returns from feeding varying amounts of grain to milk cows naturally depend to no small extent upon the relative prices of grain and milk. The approximate farm prices per hundredweight of feeds and milk in Pennsylvania during the summer (1942) were as follows: loose alfalfa hay $0.75; corn silage $0.25; grain $1.80 and milk $2.60. At the foregoing prices, the returns above feed cost can readily be computed for the various levels of feeding under the conditions of this experiment. The data are set forth in table 2.

It will be evident that both milk yields and feed costs are

Table 2—Value of Milk over Feed when Grain Costs $1.80 per Hundred-weight and Milk Sells at $2.60

Level of Grain Feeding (per cent of Haecker standard)	Number of Records	Pounds Milk Produced (4 per cent fat corrected basis)	Total Feed Cost Per Cow	Feed Cost of 100 Pounds Milk	Value of Milk Over Feed Cost Per Cow
70	2	7993	$ 95.03	$1.19	$112.79
80	10	8816	107.30	1.22	121.92
90	9	10253	119.07	1.16	147.51
100	9	11518	148.44	1.29	151.03
110	10	10879	150.66	1.39	132.19
120	4	12170	174.04	1.43	142.37
Unlimited (123.1)	22	12756	191.60	1.43	140.86

considerably increased at the higher feeding levels. There is a general increase in the feed cost of milk production as the rate of grain feeding increases. Whether the dairyman is advantaged financially by feeding additional grain to the cows will depend upon the price of the additional milk. At the foregoing prices it would appear profitable to increase the grain allowance up to 100 per cent of the Haecker Standard for milk production since the value of the product above feed cost was greatest at this level.

Since dairymen in certain sections of the country sell a high percentage of their milk for fluid consumption, they consequently receive a higher average price than is the case in sections where a very considerable percentage is made into dairy manufactured products. Furthermore many dairymen are also good crop growers and have an abundance of home grown grains. Such dairymen can probably make up a 14 per cent protein grain mixture for less than $1.80 per 100 pounds. With alfalfa hay and corn at the foregoing prices but with grain at $1.50 per hundred pounds instead of $1.80 and milk at $3.00 per hundred pounds instead of $2.60, the greatest returns above feed cost were from the cows fed at the highest grain level. Producer distributors or others receiving above the average price of milk may therefore profitably feed grain at a more liberal rate than the standard allowance.

The results of this study show that the dairy cow can readily adapt herself to variations in the allowance of feed. If the relative prices of grain and milk make increased milk yields profitable these can be obtained in a comparatively short time by raising the level of grain feeding. On the other hand in a year of feed shortage or of low milk prices, it is possible to reduce the grain allowance substantially without detrimental effects other than a

lessened yield of milk and a slight loss in liveweight.

In accordance with the information secured from these studies the U. S. Department of Agriculture has formulated table 3 as a guide to dairymen in feeding cows the most profitable amount of grain in relation to varying prices of grain and milk. The table is based upon a roughage allowance of 18 pounds of good hay per 1000 pounds of live weight daily or its equivalent in other roughage.

To use the table, first divide the local price of 100 pounds of grain by the price of 100 pounds of milk. Then select the column in Section A of the table that corresponds most closely to the fat test of the milk. Now, go down the column until the figures are reached that most nearly represent the production of the individual cow. Finally go horizontally to the right until the figure in Section B is reached in the column that represents the relationship of the price of milk to the price of grain. This number states the most profitable amount of grain to feed the cow daily. For instance, if the price of grain is $1.80 per 100 pounds and the price of milk is $2.40 per 100 pounds, the ratio of the price of milk to the price of grain is ¾. Suppose the cow is producing 30 pounds of 4 per cent milk daily. We then go down the 4 per cent column to the figure 30. We then go horizontally right to the column headed "¾ milk price." The figure found there is 13 and this is the most desirable number of pounds of grain to feed this particular cow per day at the prevailing prices of grain and milk in order to have the most profitable relationship between grain allowance and milk yields.

Table 3—Recommended Grain Allowance for Dairy Cows at Varying Prices of Grain and Milk

SECTION A — DAILY PRODUCTION OF MILK TESTING:				SECTION B — QUANTITY OF GRAIN TO BE FED WHEN GRAIN PRICE IS:				
3½% fat	4% fat	4½% fat	5% fat	1½ times milk price	1¼ times milk price	Same price as milk	¾ of milk price	½ of milk price
pounds milk	pounds milk	pounds milk	pounds milk	pounds grain	pounds grain	pounds grain	pounds grain	pounds grain
11	10	9	8	2	2	2	3	4
17	15	14	12	4	4	5	6	7
22	20	18	16	6	6	7	8	10
28	25	23	21	8	8	9	11	13
33	30	27	25	10	11	12	13	16
39	35	32	29	12	13	14	16	19
45	40	36	33	14	15	16	19	22
50	45	41	37	16	17	19	21	25
56	50	45	41	18	19	21	24	—
61	55	50	45	20	21	23	—	—
67	60	54	49	21	23	—	—	—

Everybody's Farm

Condensed from Kansas Farmer

YOU own part of a farm you very likely never have seen. Let's call it "Everybody's Farm" because that could well be the name for the U. S. Department of Agriculture's Beltsville Research Center in Maryland, 13 miles northeast of Washington, D. C. Everyone in the U. S. helps support it thru taxes and, of course, everyone profits by the work done there.

Beginning in 1910 with 475 acres, the Research Center now covers 12,461 acres, boasts 28 laboratory buildings, 31 greenhouses, an apiary, 84 barns, and 500 other buildings, including an abattoir, granary, shops and sewage-disposal plant. The annual cost of operation runs close to 2 million dollars, partly offset by products sold, but the main returns are the millions of dollars it saves farmers thruout the nation every year.

The Research Center houses nearly 3,000 experimental farm animals, more than 15,000 experimental fowls, and about 5,500 small animals, such as rabbits, guinea pigs, rats, and white mice, for laboratory tests. The scientists stationed at Beltsville include agronomists, animal husbandmen, apiculturists, bacteriologists, biochemists, biologists, botanists, chemists, entomologists, geneticists, grain technologists, home economists, horticulturists, marketing specialists, parasitologists, pathologists, physicists, physiologists, pomologists, silviculturists, soil conservationists, statisticians, veterinarians and zoologists. This gives some idea of the widespread activities being carried on at the Research Center, covering almost every phase of farm production, disease control and marketing.

The activities at Beltsville are so numerous and so intensive it would be impossible to cover all of them in one story, so let's examine here the work being done toward improving the production of livestock, poultry and bees.

For many centuries nature has been "breeding" all forms of life. She crossed them. She inbred them. She subjected them to mysterious forces powerful enough to bring about changes in the germ stuff that determines their characteristics. She put them thru hardships that only the "fit" could survive. Out of these processes, carried on over millions of years, myriads of forms of living things have been developed.

For a long time man took what

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nature gave him, but eventually he became dissatisfied and began to study methods of improvements. It was not until 1900, however, that genetics — the science of the quality of life as it passes from one generation to the other—took its place beside other well-established sciences.

Livestock breeders have not advanced nearly so far as plant breeders in applying genetics to the solution of their problems. The Research Center provides facilities for the animal genetics project that lays the foundation for the department's experiments in animal breeding. The aim of this project is to uncover new principles of farm animal improvement by systems of mating, and to test old theories for soundness. Mice are used extensively in this work, because they are well adapted to an artificial life.

For a time, dogs were used in attacking some of the more difficult inheritance problems, notably those connected with intelligence, disposition, nervousness, and other psychological traits.

It has been estimated that only one third of the country's dairy cows return a profit, one third break even, and one third fail to pay for their keep. The big problem in breeding dairy cows always has been how to reduce the percentage of low milk producers.

Records of the production of cows in the Beltsville herd have been kept for 22 years, and prove the theory that a bull whose daughters consistently produce more milk than their mothers is relatively pure in his genetic make-up for the factors insuring high levels of milk production. The use, for several generations, of bulls whose daughters have proved their sires' worth would gradually build up these factors in dairy herds thruout the nation, thus eliminating the non-paying and "borderline" cows now common in American herds.

Keeping up with "hog styles," which vary thru the years, is a major problem. The present normal trend is away from the short and fat and the long, narrow types toward a medium type that gains as economically as the larger type, but produces the medium-size cuts of meat favored by today's markets. Buyers like hams of from 10 to 14 pounds, and bacon with plenty of lean.

The swine research program at Beltsville is directed toward the improvement of swine thru breeding by the use of systems of breeding that will consistently enable breeders to produce efficient pigs that meet certain market requirements. The work at present is dealing largely with inbreeding and crossbreeding methods of swine production. Inbreeding as such does not create anything new but merely acts like a sieve

sorting the good from the bad. Beltsville scientists, taking advantage of this fact, are studying the relative merits of different intensities of inbreeding when combined with rigid selection for such characters as rate of growth, efficiency of feed utilization, sow productivity, viability and other characters of economic importance. The ultimate goal of these studies is to learn how inbreeding may best be used to improve the productiveness of swine. Altho some decline in individual merit can hardly be avoided as a result of inbreeding, particularly after very close inbreeding is practiced, the results to date are highly encouraging and Beltsville scientists feel that in years to come inbred lines of swine will play as important a part in the production of market hogs as hybrid seed corn is playing today in boosting the corn yield on a good many farms.

Another phase of the swine breeding project at Beltsville aims at a better understanding of the effects of crossbreeding, and to cross different breeds so as to combine the desirable characters of each parent breed into new strains that will perform creditably under different environmental conditions. The work centers primarily on the development of new strains from crosses between the Danish Landrace, a white breed, and several of our breeds. The object in each case is to produce a medium-type hog that is longer-bodied, plumper in hams, and higher in rate and economy of gain and that possesses the color of the domestic parent breed. The breeding stock now on hand in most of the new strains is between 7 and 8 generations removed from the initial cross and some of the strains are now being kept as closed herds. Altho final conclusions as to the merits of the new strains have not yet been drawn, the results to date show them to possess a general advantage over the average of their parent strains, ranging from approximately 5 to 25 per cent in average weight to the litter at weaning.

Genetics also has paved the way for development of more profitable sheep, goats, horses, and cattle, both beef and dual-purpose. Progress has been made too in rearing fur-bearing sheep for this country by crossing Karakul sheep imported from Asia with various American breeds.

Production records, pedigrees and progeny testing are the "Three P's" of poultry raising on the experimental farm. Beltsville experts say the heredity of a bird counts most in obtaining increased egg production, large and hatchable eggs, and lower mortality in chicks and adults.

Progeny selection and breeding have resulted in marked improve-

ment in the weight of eggs laid by Single Comb White Leghorn pullets. The roosters used in breeding this new line of heavy egg producers were selected on the basis of the average weight of the eggs laid by their sisters and their daughters.

Hens of another newly-developed line lay eggs with a high percentage of thick whites. This ability to lay eggs with thick whites, the breeders find, is an inherited characteristic. Consumers like these eggs for poaching and because they store well. Some poultry families in the thick-white group produce eggs which retain a high percentage of thick white thruout storage, whereas in other families the thick white deteriorates rapidly. The ability to maintain a high percentage of thick white appears to be inherited.

In times like these, difficult problems arise in feeding poultry that threaten to offset their productivity so carefully built up by years of breeding. The poultry nutrition workers at Beltsville anticipated many of these problems and began research to provide the answers to them. As a result these scientists developed and tested a series of practical diets for all classes of poultry that permit normal growth and egg production without use of any animal protein. These diets are built around feedstuffs that are still available in this section of the country, wheat, corn, soybean meal, alfalfa meal, fermentation byproducts, and minerals. These simple diets are better if small quantities of skim milk, meat scrap, or fish meal are included but in their absence good growth and egg production are still possible. For the duration of the war these scientists have put aside their usual research on the finer points of poultry nutrition and are devoting their full energies to solving practical feeding problems that may arise as the result of shortages of familiar protein, vitamin, and mineral supplements for poultry feeds. Some of their experiments will lower the cost of poultry production after the war as well as helping to attain a high level of production during the war.

In line with the shrinkage of the American family, these researchists are working now on a small-type turkey, white in color, with a compact body, short legs, a long keel bone, and plenty of breast meat. They seek a turkey that will mature in 25 to 26 weeks and will lay plenty of fertile eggs. To get it they are combining several strains, each capable of contributing one or more of the characteristics desired. Various types of imported and native tame and wild turkeys are being crossed, but it is expected to take several years to establish the new

type so it will breed true, these authorities say.

One beneficial insect—the honeybee—has an important place at Beltsville. There are many varieties and strains of bees in the world today, each differing from the others in usefulness and in ability to resist disease. Apiculturists at Beltsville are trying to breed strains that will excel as honey makers and also will have an inborn resistance to American foulbrood, a fatal bee infection that annually destroys thousands of colonies. As bees refuse to breed in capacity, the controlled breeding necessary to produce the new strains sought must be done artificially.

Several of the new strains show marked resistance to the organisms of American foulbrood. Others possess the characteristics essential for superior honey production.

Fruit improvement also comes in for considerable attention at Beltsville. Pomologists of the Bureau of Plant Industry, grow apple trees in large pots that are filled with sterile sand, to which nutrient elements are added in varying quantities. The drainoff is collected in large bottles on the floor and later analyzed. From the data thus obtained, the experts can determine how much of each plant food an apple tree needs for best growth, and how a shortage of any of these nutrients affects its growth. These findings make it possible for growers to select soils where apples will grow best, and the kind of fertilizer their trees need.

Corn-Shocking Jalopy

"This is our corn-shocking jalopy," said Wilbur Keifer, senior member of the partnership, Keifer Brothers, who farm in Clark county, Ohio. He was showing a visitor a 2-wheeled trailer rig with a pole like a wagon tongue sticking out behind. A few feet from its outer end was a horizontal hole. Keifer picked up an iron rod and stuck it thru the hole to form a cross.

"When we go out to shock corn," he continued, "we hook this behind a truck or tractor and take it along. It is pulled to a spot where a shock is to be built, the rod placed thru the hole and the shock set up around the cross formed by rod and pole. When shock is completed rod is removed; and the rig driven to next shock site.

Why Do Farmers Plow?

Condensed from Country Life

E. H. Faulkner

WHY do farmers plow? That should be an easy question to answer. Plowing is virtually a universal practice. Farmers like to plow. If they did not get pleasure out of seeing the soil turn-turtle—knowing the while that by plowing they dispose of trash that would later interfere with planting and cultivation—less plowing might be done; yet, farmers are encouraged to plow.

Deep plowing is approved; or in lieu of deep plowing farmers are advised to cut deep into the subsoil in every furrow. Such advice comes from farm papers, bulletins, county agents, and a long list of sources from which farmers commonly welcome suggestions and information. There should be clear-cut scientific reasons to justify a practice so unanimously approved and recommended.

If there are such reasons I have failed to find them in more than 25 years of search. As early as 1912 we students in soil management and farm machinery courses brought up the subject, quizzing professors as to why plowing should be the universal land-breaking practice rather than some surface-incorporation method.

A number of answers were suggested, none of a scientific nature; in the end, red-faced instructors had to admit they knew no really scientific reasons for plowing. They suggested that the most important justification for the practice might be that it "turned over a new leaf" for the farmer—by the complete burial of preceding crop residues, thus leaving the land free of obstructions to future movements of planting and cultivating machinery.

Our experience was not unique. The editor of one of the leading American farm papers has this to say in a letter to me under date of August 5, 1937: "It is a subject I became interested in about eighteen years ago. I made a 2,000-mile trip among soil specialists and farmers and everywhere asked the question: Why *do* you plow? I was rather amazed at the unsatisfactory answers I received. Apparently farmers do not really know. When I summed up the answers it seemed that they had only one

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good reason for plowing, and that was to get rid of weeds."

That there may be good reason to doubt whether the plow does even that is indicated in an article in the January, 1941, issue of Country Life. One writer says plowing may preserve for future germination more weed seeds than it destroys.

So the question as to the scientific reason for the universal practice of plowing is unanswered. If I were advising farmers as to proper plowing the advice would be *don't!*—a position for which there is scientific warrant.

A brief review of the "reasons" frequently given for plowing will give opportunity to point out the error involved in each, so we may take them up in order.

An administrative officer in the Department of Agriculture of one of the New England states suggests in a letter that plowing is designed to let oxygen get to the roots of plants; he suggests, too, that plowed soil will not dry out so rapidly as if left unbroken.

His reasons seem to cancel each other, indicating that he hadn't considered these two suggested effects simultaneously. Letting air into the soil is an efficient way of drying it out, particularly that portion which is disturbed. Since the roots of crops must develop first in this inverted—and necessarily dried —section of soil, it seems my correspondent really gave a good reason for not plowing.

This idea that it is necessary to let oxygen into the soil has been in circulation for many years. It seems that those who pass it on do not pause to examine its implications. In a world organized as this one is, air is all pervading except where something else fills the space.

There is considerable space throughout all soils from the surface down to the level of ground water. Part of this is filled with capillary water clinging to the rock fragments themselves; but the spaces are too large for capillary water completely to fill them, so air must fill the rest. When the water table rises this air is forced out of the soil; when it recedes again the air reenters.

It might be objected that more oxygen is required in the soil than can enter the undisturbed mass. Perhaps. In that case we should study the undisturbed forest floor. The surface of the soil where the giant Sequoias grow was suitable for their needs a thousand years before the mouldboard plow was invented. It is not thinkable that such giants could have developed in the absence of an optimum amount of oxygen in the soil.

It must be, then, that growing plants do not require more oxygen in the soil than naturally enters it in the absence of water.

There may be extreme situations, for instance, where the soil has been excessively compacted by the trampling of animals or people, that would require special treatment. But it is not clear that plowing would be the right treatment. The freezing and thawing of soil during winter usually makes a well-tramped path grow up in vegetation the following season, unless its use as a path is continued.

Various books on agricultural subjects published around 1910 do give what may be considered hypothetical reasons for plowing. Most of them are vague enough to be interpreted in a number of ways. Here is a list:

(a) Structure is made more open or more compact;
(b) Retention and movement of water is affected;
(c) Aeration is altered;
(d) Absorption and retention of heat is influenced;
(e) The growth of organisms is either promoted or retarded;
(f) The composition of the soil solution is affected;
(g) The penetration of plant roots is influenced.

This list is compiled from a single paragraph of a well known soil text written in 1909. Though the authors did not realize it at the time, it is a bit of literary gumshoeing around a highly dangerous subject. The intent, apparently, was not so much to give information as to indicate in what various categories the student might expect to find it.

The implied assumption is that plowing improves the soil as environment for plant roots. The practice could scarcely be justified otherwise. Just how this improvement is accomplished is left wholly to the bewildered student's imagination. And while he is trying to rationalize this puzzle he's likely to conclude that—if plowing really does improve the soil as a site for plants—the vegetation growing so lush on unplowed land must be to some extent underprivileged. Of course, even an astute student may miss that angle. It is obvious that most of us did.

Assuming plowed land to be better for plant growth, we should find grass growing more freely on plowed land than on similar unplowed land near by. Weeds, too, should show preference for plowed land. Volunteer growth should take over and develop more rankly after land has been plowed than before. Do they?

Observation is that until plowed land has subsided again to its former state of firmness, plants develop in it quite tardily, if at all. When dry weather follows the plowing it may be weeks or even months before either natural vegetation or a planted crop will make normal growth.

The fact is that "bare" land, which notably erodes worse than soil in any other condition, consists almost wholly of land that has been disturbed recently by plows or cultivating implements. The only other "bare" land consists of areas denuded of top soil by erosion or other forces. There is significance in the fact that erosion and run-off are worst on bare land, and that bare land is defined as indicated above.

Take a casual glance at the landscape. Not only does the unplowed land continue to support its growth nicely while the plowed land is recovering its ability to promote growth; even the margins of the plowed field itself continue to support their growth.

Such evidence backfires into the argument that plowing produces a better environment for plant roots. Quite the contrary. The loosening up, pulverizing, and inversion process seems a first-rate way to make good soil incapable of performing its normal functions in plant growth. The explosive separation of the soil mass wrecks all capillary connections temporarily; the organic matter sandwiched in further extends the period of sterility of the soil due to dryness. So it is not strange that plowed soil is bare.

Before it is plowed, grass, weeds, and other vegetation grows normally because there is unbroken capillary contact from particle to particle — extending from the water table to the surface; after plowing, this source of water is completely cut off until the organic matter at the plowsole has decayed; hence the soil simply takes time out from its business of growing things until the restoration of its normal water supply.

There is no mystery about it. It is simply the working out of natural law. Wishful thinking is peculiarly ineffective to prevent this undesired outcome of plowing.

Another objectionable feature of plowing is the merciless troweling administered by the moldboard to that portion of the furrow slice which is brought from the plowsole and exposed to wind and sunshine. This effect is not noticeable, and probably not damaging, if the soil to the full depth of plowing is dry enough to crumble; but in these days when all soils seem to become more troublesome to handle as the years pass it is seldom that spring plowing can be done early enough if the farmer waits for the wet spots to dry out deep enough.

Too often in his haste to get the year's work started he rushes into the plowing while the soil glistens as it leaves the moldboard. Some men even plow when water follows them in the furrow. Such management of the soil certainly is playing fast and

loose with resources which the soil might contribute to crop growth.

Plowing done when the furrow slice is plastic creates clods; and every clod is so much soil mustered out of service for the season. The tremendous pressure necessary to separate the furrow slice from its base compresses effectively any soil that is moist enough to be plastic; and a moderate amount of clay in plastic soil serves to harden the mass upon drying so that adobe-like clods result. Smoothing implements may reduce the size of these lumps, but as clods they are likely to remain aloof from the rest of the soil throughout most of the growing season.

Such evidence of damage done by the mouldboard has passed unnoticed by farmers as well as by most other people. Several reasons may be given to account for the public's blindness to obvious faults in the mouldboard plow.

To begin with, conditions such as modern farmers face were remote indeed when the plow was first used with a crude mouldboard attachment. That was two hundred years ago. The English countryside at that time was chiefly unbroken forest. The land that had been cleared of trees still was not very well subdued, for it was a hopeless task to try to keep the soil free of competing weeds and shrubs while a crop was growing.

The forest was forever trying to recover the lost ground, and the only really effective tools farmers had against encroaching saplings, perennial weeds, etc., were crude hoes, mattocks and spades. Such plows as they had threw the soil both to the right and to the left. They did not cover trash very well, much less uproot permanently the wild growth which cumbered the ground. The "bull tongue" plow of the South is somewhat on the same design as most of the plows which preceded the mouldboard.

Into such an environment the mouldboard was introduced. It was a God-send. Pulled by an ox, or even by men, this plow would actually lift and invert the soil. This made it possible by careful work to eliminate completely the perennial weeds and some of the smaller shrubs. And, which was more important, the farmer who previously could manage a few square rods now could raise food on an acre or more.

Such an invention at a time when England was never far from actual starvation captured the imagination of rural people everywhere. It was electric in its effect upon contemporary thought. The population now could eat regularly and well, provided enough farmers could have mouldboard plows.

Inventions did not happen often in the early eighteenth century. New aids to living were rare, indeed. The mouldboard plow, destined to revolutionize the lives of world populations, marked the beginning of a new era. So completely did it fill the greatest material need of a poorly nourished world that it was accorded a place in people's thought such as usually is reserved for saints and priests only. The plow had saved humanity, almost literally.

The farmer of that day had more trouble keeping unwanted things from growing than in getting his crops to grow. For him, then, the use of the plow was excellent strategy because it did create temporary conditions which made it impossible for weeds to grow. This gave him time to get the root and grain crops started before the wild vegetation recovered from the setback caused by the plowing.

Once his crops were well started the incomparable richness of the black loamy soil kept them well ahead of the weeds. Now that the black loamy soil has completely disappeared from most land in this country, our proper strategy may well be the exact opposite of what was advantageous then.

Those earliest crude mouldboards could not be favorably compared with the mirror-like product of today's factories. Hammered out by hand at forges erected at or near the ore mines, they could become smooth only through much use. Designed by guess after trials, they never became stabilized to dependable shape until a century after farmers began to use them universally.

But, despite its shortcomings—much easier to appraise from our viewpoint than from that of the contemporary farmer—the plow was, in that crude state, the greatest invention of the age. It dispelled hunger as the first oil lamp dispelled darkness. Aladdin's lamp was no more wonderful.

When a century later the first experiment station was established at Rothamsted, England, no one bethought himself to question whether the neat work done by the mouldboard plow might be responsible for the trouble farmers were beginning to have growing crops. To have suspected the plow of contributing to the incipient poverty of their soil would have been considered by those farmers as the acme of treason.

The men of science who manned that first station, as well as the state experiment stations later established in this country, inherited that unquestioning reverence for the plow. The doctrine of the Divine Right of Plows passed down from generation to

generation so that the possibility that the plow might be blamable for the waning fertility of the soil never seriously occurred to anybody along the line.

For decades, to my own personal knowledge, men have sensed that the plowing in of a layer of organic matter at the plowsole must of necessity interfere with capillary movement; but the subconscious feeling that The Plow Can Do No Wrong apparently prevented anybody from doing anything about it.

The result is that, though we have had experiment stations in this country for more than three-quarters of a century, no experiment station ever conducted — prior to 1937—tests designed to compare directly the effects of incorporating organic matter into the soil by different implements, including the plow. Neglect to do this has definitely handicapped the development of basic soil information which easily might have prevented the debacle into which our American soils have drifted.

When the above facts have been considered one need not be a psychologist to know that the basis of our soil problems may be as much psychologic as otherwise scientific. If the reader thinks this is based altogether upon an imaginative picture of the origins of the plow, let him consider some quotations from authentic agricultural literature of the present century.

The Yearbook of the U. S. Department of Agriculture for 1903 carries this statement on page 284: "Decayed organic matter, by itself or in combination with mineral soil, absorbs moisture much more rapidly than soil containing little or no organic matter; hence, the greater the amount of leaf mould and other litter, the more rapidly will the rain be absorbed. Rapidity of absorption is also influenced by the degree of looseness of the mineral soil. In the forest the mulch of leaves and litter keeps the mineral soil loose and in the best condition for rapid absorption."

If that statement seems old enough for its validity to be questioned, compare its import with the following from the Department of Agriculture's Yearbook for 1938, pages 609-610: "Forest litter—the carpet of dead leaves, twigs, limbs, and logs on the forest floor—serves in several ways. Water falling as rain on bare soil dislodges silt and clay particles by its impact. These are taken into suspension and carried into the tiny pores and channels between the soil particles as the water makes its way downward. Very shortly the filtering action of the soil causes the openings to be clogged by the particles; water can no longer move downward through the soil, so it flows over

the surface carrying with it the dislodged silt and clay; and erosion is actively under way. A protective layer of litter prevents this chain of events by absorbing the impact of the falling drops of water. After the litter becomes soaked, excess water trickles gently into the soil surfaces, no soil particles are dislodged, the water remains clear, pores and channels remain open, and surface flow is eliminated except in periods of protracted heavy rains."

I can detect no significant difference in the meaning of the two quotations. The latter gives a more intimate picture of the processes involved, but it fully confirms the less graphic description in the earlier statement. Moreover, every experiment ever conducted confirms the truth presented.

A paragraph from a letter dated February, 1940, should be interesting in this connection:

"The Department of Agriculture has long been interested in developing new methods of soil treatment which will maintain and build up the organic matter content of the soil. Studies carried out by the Soil Conservation Service at a number of locations have already produced unusually outstanding results along this line. At Statesville, North Carolina, for example, it has been found that several inches of pine needles spread over the soil surface reduced the loss of soil by erosion to a point almost beyond measurement. There was also a considerable increase in the organic matter content of the soil and indications point to a worthwhile increase in crop yields. In Nebraska subsurface tillage, which leaves straw and other litter undisturbed on the soil surface, has proved remarkably effective in reducing soil and water losses and in preliminary experiments has led to a material increase in the yield of several crops tested."

This was signed by the Assistant to the Secretary. It may be said that my letter to which this was the reply had mentioned and asked for comment on the fact that the mouldboard plow had never been put to test for validation.

The fact that no advance whatever is apparent when the 1903 statement is compared with those of 1938 and 1940, indicates that effort to implement the earlier findings into general farm practice had been neglected. The statements from the Yearbooks refer to forest soils, of course; but that fact must not obscure the bigger fact that the findings discussed concern principles of universal application.

Principles which are valid in the forest are valid in the field, always; so it seems that re-

searches into the importance of organic matter on the surface of crop land should have been started as soon as the earlier announcement had been made. If any such work was begun earlier than 1937 I have been unable to find any record of it.

Well, that's about the story as to why farmers plow. If there is science back of it, it must be psychology. No other viewpoint seems to make sense.

Though it is notable that agricultural scientists intend to promulgate only such teachings as have been thoroughly tested and found to be unquestionable, the fact that the mouldboard plow had never been subjected to such tests seems never to have occurred to scientific men. There is no evidence whatever that this omission had been detected until early in 1940.

All of which is strong presumptive evidence in favor of the theory that psychology has been an important factor in our thinking about the plow. Farmers plow, then, because they like to plow.

Cutting Fall Pig Costs

Condensed from Capper's Farmer

WHEN times are normal, the Corn Belt's fall pig crop is about half the size of the spring outturn. Yet some farmers insist fall litters make more money than those farrowed earlier; that they are easier to start because weather in August and September is more favorable than that of February and March and less shelter and attention are required. Other swine growers admit bluntly that they raise fewer fall pigs because they are less profitable.

A study by staff members of Capper's Farmer covering typical farms in a dozen of the biggest states indicates management methods determine whether fall litters make a showing as good as those started in spring. Growers who find autumn pigs as profitable as spring pigs, hold rigidly to these management practices which reduce waste and cut costs: 1. They provide rye or other cold-weather green pasture or use green legume hay or alfalfa meal to save grain and protein supplement, speed gains and reduce costs. 2. Sows, during gestation and nursing, get a ration balanced with protein and pigs are fed protein liberally until they weigh 50 to 75 pounds. Any skimping on protein is done after the 75-pound weight is reached. 3. Pigs are full-fed from the time they will eat grain. 4. Pigs are farrowed on clean ground and are held there until they are sold

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to keep them free of parasites and soil-borne diseases.

The grower who follows none, or only part, of these practices, loses on fall pigs in normal times. At present, spread between feed and pork prices is so wide there is little chance of monetary loss. However, all grain available is needed to produce food and munitions, and it is a disservice to the country to waste it in hog production by methods not economical enough to produce a profit in normal times.

Most notorious feed wasters are pigs maintained in dry lot without green feed or protein supplement. Pigs that went on straight grain ration at 54½ pounds in a Missouri test required 1,020 pounds of corn for each 100 pounds of grain. When grain was supplemented with alfalfa hay and protein, only 270.8 pounds of corn were needed for the same gain. Here, 16.34 pounds of hay and 61 pounds of protein saved nearly 14 bushels of corn. That makes it easy to understand why the man who feeds only grain quits fall pigs.

The same test showed how he might get by with spring pigs if no supplement were added to grain. One lot grazed rape and green oats while on a straight corn ration. These pigs used 409.4 pounds of corn for each hundredweight of gain. Thus, pasture saved 610.6 pounds of corn for each 100 pounds of gain. While cost of gains was not excessive, rate of gain was extremely slow—only .6 of a pound a day, compared to 1.45 pounds a day when protein concentrate was fed along with green stuff.

For the man with sows bred for fall farrow the course is plain: It is imperative that he seed rye or some other winter grain for fall and winter pasture, or that he put up some fine-stemmed, leafy alfalfa or clover to use when summer pasture quits. There is no place where last-cutting alfalfa will make a higher return than in the hog ration. First-year sweet clover or early-harvested lespedeza hay make satisfactory substitutes. Many producers pasture rye while it will provide all the roughage fall shotes need, turn to hay when it will not. Some use legume silage instead of hay. Nebraska tests show Sudan compares favorably with alfalfa if harvested when 18 to 20 inches high.

In the past, much alfalfa meal has been fed to hogs. Last winter the supply was inadequate, and many informed feed men are predicting it may be still shorter next winter. The only safe course is to cure what will be needed. It may be fed in racks or it may be ground and mixed with supplement and grain.

How much hay or meal is it advisable to feed? A number of

tests help provide the answer. At Wisconsin, 4 lots of pigs were fed rations containing 5, 10, 15 and 20 per cent alfalfa, respectively. Cheapest gains were made by the lot getting 15 per cent. This was followed closely by the group that got 10 per cent. Gains were costliest for the lot that received but 5 per cent. At Beltsville, Maryland, alfalfa, sericea lespedeza and soybean hays were ground and added to swine rations. Those getting alfalfa required least grain and made fastest gains. Soybean hay was second and sericea a poor third. Sericea is coarse and woody and is high in tannic acid, so it probably is rankly inferior to Korean lespedeza as a hay for hogs. In this test, gains were fastest with all the hays when they were fed at lower level than the one most satisfactory in the Wisconsin trial. However, when the amount was increased from 5 per cent to 10 per cent, each extra pound of hay fed saved a pound of grain. That is a good trade.

Many hog men who raise spring litters successfully on clean ground farrow autumn litters there, but, to provide shelter, move them at weaning time to old barnlots that are infested with worms and infected with necro and other diseases. This may result in losses from runts and deaths great enough in a single year to pay for all the field shelters needed. Some who make as much from fall litters as from spring find a strawstack the only shelter required. The next year another stack is threshed in the field that is to carry fall pigs. Others move several colony houses together or use sectional shelters that may be hauled to the field and set up in a few hours.

A common mistake with fall pigs in made by attempting to rough them thru the winter in the belief they can be finished on grass in the spring at a saving of grain and protein. All tests show this a wasteful practice because of the long period maintenance rations must be fed. It is a pretty safe bet that the management methods that will give the fastest gains also will give the cheapest gains when economical feeds are used. Part of the value of green feed and protein in the ration is the ability of these elements to give the pig a better appetite; make him eat more feed. In the 133-day Missouri tests mentioned, pigs on straight corn ate only 1.56 pounds a head daily, those on corn and pasture 2.49 pounds, and those on corn, protein supplement and pasture 5.12 pounds. The second lot gained 4 times as fast as the first; the third lot nearly 2½ times as fast as the second, and nearly 10 times as fast as the first. Another pen in this test got corn and protein

only. The protein had greater influence than green feed in speeding gains. It induced pigs to eat 2.63 times as much grain daily as those on corn alone, and they gained 7½ times as fast. However, adding green feed to the grain-protein ration increased corn consumption 21.6 per cent and gains 25 per cent.

The protein problem remains difficult, with the tightest situation in animal source supplements. Any tankage, meat scrap, fish meal or milk that can be obtained should be reserved for brood sows during gestation and nursing and for pigs to 75 pounds. For drylot pigs, from weaning to 75 pounds, Illinois station recommends a supplement of 50 pounds tankage, 25 soybean meal and 5 alfalfa meal. Pigs that get such a supplement will do fairly well from then to market time on a supplement of 75 pounds soybean meal and 25 of alfalfa meal. The station advises that if animal source proteins cannot be obtained for a home-mixed supplement, a commercial protein containing it should be bought for use to 75 pounds.

Pasture Farming Makes 265 Pounds Beef Per Acre

Condensed from Soil Conservation

Dwight D. Smith

Project Supervisor, Soil Conservation Experiment Stations, Columbia, Missouri

CUTTING the labor cost to less than one-eighth, bringing erosion down to one-third or less, selling less of the soil fertility off the farm in the crop, yet producing more per acre, is essentially what is being accomplished by the soil-conserving pasture system of farming.

An average of 265 pounds of beef per acre was produced per season on the wheat-lespedeza grazing areas at the cooperative Soil Conservation Experiment Farm at McCredie, Mo., where measurements of erosion from pasture systems of farming are being made. This has been the top producing system of the five which are being studied. The equivalent in corn production of the 265 pounds of beef is 41 bushels per acre. This is more than the average corn yield in the

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corn-oats rotation. It is the highest corn-yield equivalent of all the five areas under measurement on which the crops are partially or all grazed out.

Good quality yearling Hereford steers and heifers have been used for the grazing trials. They were turned on the wheat about the third week in April, and grazed there until about June 15, when the wheat was gone. They were returned to the area about July 1 for the grazing of the lespedeza, and remained there until about October 1, when the area was disked and drilled to wheat. By this system, neither labor nor farm machinery is used on the areas except in the fall, when the weather, as well as the supply of farm labor, is generally more favorable for field work than the spring and early summer. The lespedeza has reseeded itself each year after the original seeding. Agricultural lime at 3 tons per acre was applied at the beginning of the experiment, and 100 pounds per acre of 0-20-10 fertilizer is applied each fall when the wheat is drilled.

This cropping system, with the soil treatment, has provided good erosion control. The soil loss has been only 27 percent of that from the corn-oats system, and 57 percent of that from a corn-oats-meadow system. The wheat-lespedeza combination has given better erosion control than any of the common cropping systems except continuous grass. This is because it provides a growth of surface cover throughout most of the year, particularly during the season of heavy rainfall. Ordinary disking of the lespedeza in the fall mixes the stubble with the soil without complete covering. A field cultivator would do even a better job. Thus, some protection against erosion is provided during the period in which wheat is developing. During the summer the thick foliage of the lespedeza prevents rain from beating on the soil, and the sturdy stems form barriers to runoff water. Wheat provides protection during the spring. On sloping land, however, contouring, and generally terraces, are necessary supporting practices for ideal erosion control.

Timothy-lespedeza and timothy - sweetclover - lespedeza are other pasture systems that give even better erosion control than wheat-lespedeza, and required no labor, power, or machinery, except when started or renewed. These are systems that do not require supporting practices for control of erosion when once established, and when the waterways are covered with grass. The beef production by these two systems has been at the same figure to date, but was only 85 percent of that from wheat-lespedeza. It has averaged 225 pounds

per acre, or an equivalent in corn production of 35 bushels per acre. These systems have given almost perfect control of erosion, and the area with the sweetclover has had an extremely low loss of rainfall as runoff. The soil in both these systems has been limed, and it received 0-20-10 fertilizer when the systems were established. They had not had the annual applications of phosphate and potash that were used in the wheat-lespedeza, but they will receive 0-20-10 fertilizer at intervals of about 2 years in the future.

These pasture systems meet the requirements of ideal farming plans for a large acreage of rolling lands, particularly those of medium to low fertility. They provide fertility maintenance, since commercial fertilizers are periodically applied and manure is left on the land by the grazing animals. Adequate erosion control may be had with these pasture systems by the use of the less expensive supporting practices, because of the natural erosion-resisting qualities of the systems. The use of labor, power, and machinery in crop production is reduced to a minimum. The returns in production are at least equal to, and in most cases increased over, those of other systems of farming. This is a fortunate combination of more intensive production and profitable return on labor, all with a high degree of conservation of both the fertility and the body of the soil. It is a case in which soil is being conserved and yet pays big dividends.

Sterilization of Small Water Supplies

Condensed from The Indiana Farmers Guide

Leo Louis and Fred Farr, Jr.

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AFTER a new well has been completed, or when repairs have been made to a well or pump, or when a well has been flooded or subjected to direct contamination of any kind, it is necessary to render the well safe for use by means of sterilization.

Sterilization can be defined as an act of killing bacteria or eliminating their power of reproduction. Sterilization of wells is usually accomplished with the use of a chlorine product. Chlorine is a powerful oxidizing agent and has proven to be the best chemical available to kill pathogenic bacteria.

When any work is being done on a pump or well, the act of handling the pump parts or the well casing will probably contaminate these parts. The well driller or the mechanic working on the pump or well may be a carrier of certain intestinal disease bacteria and by contact may thus transfer these organisms into the water in the well. Pump parts or the well casing will very probably lie on the ground in the barnyard, and surface contamination may thus be transferred from the ground surface into the well water by means of the casing or pump parts.

After a new drilled or driven well has been completed the well should be pumped to waste for several hours or until the water discharging from the pump appears to be clear. This serves to remove much of the sand and clay particles from the bottom of the well and will also serve to flush the pump drop pipe. When this procedure is completed the well is ready for sterilization.

Powdered chloride-of-lime can be purchased from most grocery or drug stores. This chemical usually contains approximately 25 percent available chlorine. However, the product is not very stable and the chlorine strength will not remain at its maximum unless the container is tightly sealed and the product is fairly fresh. Laundry bleaches such as Chlorox, Zonite, Stero-chlor, B-K Solution, or any other chlorine solutions obtainable at grocery stores can also be used in sterilizing wells. These solutions may

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contain from 1 percent to 10 percent available chlorine. The chlorine strength is stated on the label of both the laundry bleach bottles and the chloride-of-lime cans.

The quantity of the chlorine products needed to sterilize a well is based upon 50 parts of chlorine to a million parts of water. To eliminate mathematical calculations it is safe to use from one-fourth to one-half pounds of chloride-of-lime for each 100 feet of depth of a drilled or driven well six inches or less in diameter. If the chlorine bleach solution is used, the amount needed can be based on a ratio of six pints of a 1 percent solution for each 100 feet of depth of a drilled or driven well six inches or less in diameter. Consequently, if the label on the bottle states that the solution contains 5 percent available chlorine it will only be necessary to use 1 1/5 pints of the solution for each 100 feet of depth of a well six inches or less in diameter.

In using the chloride-of-lime powder, it is necessary first to mix the powder with a small amount of water into a thin paste, and then dilute the paste to approximately one gallon with water. This solution should be poured into the well, either directly into the casing of a singular tubular well or into the annular space between the outer casing and the drop pipe of a double tubular well. If the pump drop pipe is not equipped with a foot valve at the bottom, it is also possible to pour the solution down through the pump and the drop pipe.

In the case of a new well the solution can be placed in the well before the pump is installed. The pump should then be placed in the well and the water in the well agitated by intermittent pumping. The pump should then be operated until a strong chlorine odor is apparent at the pump discharge.

Dug wells which have been subjected to contamination should first be pumped dry, cleaned, and the walls scrubbed down. When it is merely a matter of having repaired a pump in a dug well it is not necessary to pump the well dry and to clean and scrub the walls. If it is not possible to pump the well dry, the pumping should be continued until the water becomes clear. The well should then be allowed to fill and if it is not clear, it should be pumped out again.

When clear water is obtained, for each foot of depth of water one-fourth pound of chloride-of-lime should be used for wells from one to five feet in diameter, one-half pound for wells six or seven feet in diameter, and one pound for wells eight to ten feet in diameter. If the chlorine bleach solution is used, the amount

needed for each foot of depth of water is two pints of a 1 percent solution for wells one to three feet in diameter, four pints for wells four feet in diameter, six pints for wells five feet in diameter, ten pints for wells six feet in diameter, sixteen pints for wells eight feet in diameter, and twenty-four pints for wells ten feet in diameter. When using chloride-of-lime powder, the same procedure for adding the powder to the well should be used as outlined above for drilled and driven wells. If the above dosages do not produce a taste in the water, additional chloride-of-lime or chloride bleach solution should be used. Cisterns should be handled in the same manner as dug wells.

After a well has been dosed with chloride-of-lime or chlorine bleach solution, the well should be allowed to stand for twenty-four hours. After this period, the well should be pumped to waste until no further trace of chlorine is noticeable in the water. A sample should then be taken from the well and submitted to the laboratory of the State Board of Health or some private laboratory for a bacteriological analysis. Only in this way can one determine whether the sterilization has been adequate and whether the well is safe for use. The water should not be used for drinking purposes (unless it is first boiled for ten minutes) until a satisfactory sample is obtained.

If it has been possible for any contamination to get into the house piping, these pipes should first be thoroughly flushed and then sterilized by pumping the chlorinated water from the well into the pipes until all of the lines are completely filled with chlorinated water. This can be accomplished by "bleeding" the faucets at different points on the system and in turn "pulling" the water through the various pipes. The chlorinated water should then be allowed to remain in the pipes for a period of twenty-four hours after which time they can be flushed thoroughly.

Hand Pollination of Apples

Condensed from Better Fruit

IN these days of rationing and food shortages, hand pollination of apple trees will do much to increase food production, and this year, despite the acute labor shortage, there is just as much hand pollination in western orchards as formerly, while the number of eastern orchardists using this new method has doubled.

There were 7,000 ounces of pollen used in Washington orchards this spring, and at least 2,000 in the apple districts of the East and Mid West, where the practice is comparatively new.

Proponents of this aid to nature call hand pollination of apple trees crop insurance, wherein a good fruit set is assured in spite of weather conditions during blossom time. The practice costs less than thinning, and where hand pollination is really needed, no thinning is necessary, as the apples are properly spaced by the "human bees."

The cost of pollinating this year averages seven dollars an acre for pollen and fifteen dollars for labor.

The history of the hand pollination of apples is interesting.

It was just fifteen years ago that Leo Antles, now farm development agent for the Puget Sound Power and Light Company, and Bill Luce, now county agent in Yakima, first began work in this new field. Aiding the pioneers was Fred Overly, Washington State College horticulturist at Wenatchee.

They could see that as new orchards, with solid blocks of single varieties were coming into bearing, the production was not as high as it had been where possibly as many as a dozen different kinds had been mixed, in earlier plantings.

The selected varieties weren't self-fertile, Antles explains.

Hand pollinations were first attempted in 1928 on a small commercial basis.

Hundreds of tests were made, and Antles at some times had nearly as many tags on tree limbs as there were blossoms.

Various methods were tried, until now the small brush is the most popular method of applying the fertile pollen, gathered from earlier districts, to the tree blossoms.

The hand pollination method has come into its own, with the process used on at least 3,500

Reprinted by permission from Better Fruit, 329 S.W. Fifth Ave., Portland, Oregon, May, 1943

acres of apple trees this year, but if further proof of its value were needed, it is given by the results of hand pollination, done for the first time this year, on the 400 acre apple ranch of the progressive Torres brothers, in north central Mexico.

Leo Antles flew to Mexico this spring, and for two weeks he worked with the operators of this largest Mexican apple property.

And this crop will actually be many hundred times bigger than any other crop the tract has produced.

Due to weather conditions, the fact that the Mexican orchard is at a high altitude, where there is little insect life to spread pollen, and because the block plantings of non-fertile varieties are large, only small crops of a few apples per tree have been harvested from the vigorous young orchard in the past.

Antles and the operators, aided by scores of peons, got to work at once, and before the fruit expert left the ranch, it was evident that the hand pollinated trees would bear full crops.

With long blossom periods, the growing conditions in the Mexican State of Durango, where the tract is located, are entirely different from those in the state of Washington.

The Mexican jaunt, with a marked success where all other methods of getting a crop on the trees had failed is a graphic indication of the value of hand pollinating, and a fitting culmination to the many years of trial and error and tedious experimentation in this field.

Hand pollination in the orchards of growers who have used this method is making every tree produce its utmost, when production is vital to the nation's welfare, as well as to the financial well-being of the individual grower.

A System for Photographing Your Herd

Condensed from Holstein-Friesian World

Ted Prescott

TO the purebred breeder a continuous pictorial record of the herd is nearly as important as records of production, classification, freshening, breeding, etc.; for the sale of surplus foundation animals should produce an important part of the farm income, and all too often, for want of a picture the sale is lost.

In spite of the fact that the greatest advantage of purebreds over grades is their higher market value, the vast majority of all the purebred breeders in the country neglect or even ignore entirely this potentially profitable part of their business, while those few who are willing to spend a little time make the important sales. Even if you belong to that majority and rely mostly upon the "call in" trade from your own neighborhood, you will still find good pictures well worth the effort spent in making them. The only sure way to get them is to make picture-taking a regular part of your job.

The best time to photograph a cow is usually a few days before she freshens, providing the udder isn't caked out of symmetrical shape. Being heavy with calf she will be deeper bodied and in good flesh. She may, however, be "in bloom" at some other time. Be your own judge, but when you think she is just right, *drop everything and get the job done*, just as you cut your hay when it is ready. You want the best possible picture of her you can take, and no other will do quite as well.

Since you can never tell when you will need a picture of any certain cow, make it a regular policy to take all important ones, in turn, as they freshen or look their best.

High priced equipment isn't necessary; but you do need to know how to use the camera you have. With the simple mechanics of loading, making focal adjustments and changes of shutter speeds (if you have a folding camera) learned from the manual that came with the camera, and from your experience with it, there are but three things to remember for taking mechanically good pictures:

(1) Correct focus to assure sharp, distinct images; (2) Prop-

Reprinted by permission from the Holstein-Friesian World, Laconia, N. Y., August 28, 1943

er exposure to yield a technically good negative that will in turn give a clear print; (3) Good composition, which in these cow portraits simply means standing close enough to the animal that she will fill almost the entire width of the picture, but not so close that part of her is cut off. Study the picture in the finder—what you see there you will get in the picture.

If you have a box camera (like the Kodak Brownie) that has no special adjustment for nearby or distant objects, all objects farther than eight or ten feet will appear reasonably sharp. In photographing a mature Holstein you cannot stand much closer than 12 to 15 feet without cutting part of the animal out of the picture, so the only precaution necessary with such a camera is to stand at the distance at which the animal just nicely fills the image you see in the view finder. It will automatically be in focus. With this type of camera you need bright sunlight for best results.

If your camera is the folding type it is necessary to set the lens pointer at the correct distance between camera and subject to get nearby objects (6 to 15 feet) in proper focus. Either pace off the distance, or better, use a pocket range finder (Kodak makes an inexpensive one) and then set the pointer at the right mark. You should focus such a camera on the part of the animal nearest you.

We use a Graflex camera that takes a 4 x 5 picture on roll film. For dull or cloudy days we use Kodak XX film, with an exposure of 1/50th of a second at f/8 (lens opening). On a bright day we use Kodak Verichrome film with an exposure of 1/100th of a second at f/8, or 1/50th at f/11. These exposures should work equally as well in any of the folding type cameras. Once you acquire the knack of judging the light and of setting the shutter speed and lens opening properly, you can readily gauge the exposure correctly under like conditions next time.

It is a good idea to select one place to take your pictures, and then take all of them there. You will need to consider two things in choosing a studio. First, you will need a good background, second, a "maneuvering space" in which you can lead your cow in posing her, so arranged that you can lead her slightly upgrade and at about a 90-degree angle to the sun.

Green grass makes an excellent background, particularly if it is a long way off, such as rolling hills in the distance, with the skyline well above the topline of the cow.

Buildings are most always bad, particularly if nearby, because so

often the windows or doors appear to be growing out of the animals's back, and openings in a building always show black in the picture, spoiling the outline.

As a good safe general rule, try to have your background clear and open ground for at least 100 yards behind the cow, with hills, or a distant grove of trees way back against the skyline.

Having found a suitable background, choose a position before it in which you can pose your animal at an angle of 90 to 100 degrees to the sun, in order to avoid shadows made by ears or head which may "black out" the eye or the neck.

The final requirement for your studio is that the ground have a gentle rise in the right direction to allow leading the animal ahead for posing at the correct angle with the sun. Such a rise tends to make the pose appear more alert.

Professional livestock photographers have developed two standard poses, one for milking cows, and the other for dry cows, heifers and bulls. The cow showing a well-made-up udder is posed with the rear leg nearest the camera slightly ahead of the other, so that a bit of the rear udder shows. This gives a much better impression of the length of the udder. In the other pose you merely reverse this hind leg position.

By leading the cow ahead, one short step at a time, she will usually pose herself into a more natural, alert position than you can get by placing her feet by hand, though it is frequently necessary to shift one foot back or ahead to get them all showing straight underneath her.

Posing the animal is sometimes quite an ordeal, requiring patience, particularly with animals not well broken to lead. A bit of extra time spent at this point, however, usually means the difference between a good picture and a poor one. So stick to it, for you will be well rewarded if you get an alert, well-posed cow as a final result of your efforts.

This is largely a matter of timing—having your camera set for the proper exposure and focused correctly, ready to "shoot" the second the cow looks just right. You will want to check your focus at the very last minute, after the animal is all posed. You are then ready for your third helper to go into action. Stepping suddenly out of hiding, at least 100 feet away from the subject and a bit on your side of her, so that when she looks, her head will be turned slightly toward you, he opens an umbrella, or waves a newspaper or jacket, while walking slowly toward her. The usual response from the cow is an alert curiosity, head raised, eyes wide open, ears forward. When she looks like that, snap the shutter.

Take the milking cow from an angle slightly to the rear, in order to help show that rear udder. Take all the pictures from eye-level, just the way you would look at them naturally. You will show the udder better this way than by lowering your camera to the level of the udder, which results in a rather grotesque worm's-eye view.

It is usually wise to take a second exposure while you have her all ready, and that's all there is to it. Sometimes it takes ten minutes, sometimes half an hour, most always a lot of patience.

Don't pull the trigger until her ears are up. Be careful to have the lead strap on her halter come out on the side of her head farthest from the camera. If the flies bother her, use a spray gun, and don't shoot while her tail is switching. Watch out for shadows on her neck and flank and try to get the sunlight on her udder. Be sure all four legs are under her and show in the picture. It's a good idea to doll her up a bit before you bring her out by washing out the tail and putting a little shine on her coat.

When the prints and negatives come back from the finisher, put those for each animal into a separate envelope and mark it with the animal's name. Then you can file it alphabetically so you can find it when you want it.

You may not need the picture for ten years, or she may have a bull calf within the week that your snapshot will help to sell. Someday you're almost certain to want a good picture of that cow, and then you'll be thankful you spent the little time it took to make it. Perhaps it will mean the difference between $10 for her bull calf to the butcher and $100 (or more) to a breeder. Or she may someday be the great granddam of an exceptionally valuable animal for which you want to make a picture pedigree. You may want to send a print to your breeding journal for a news item or an ad. Even if you only looked at it for your own satisfaction, you would still feel it well worth the time and effort spent in taking it.

A Paying Experiment in Farm Tenancy

Condensed from Southern Agriculturist

J. Gilbert Hill

FARM tenantry will pay, both the tenant and landlord. A farm family can have a decent living, pay doctor bills, get out—and stay out—of debt, show an annual profit, and at the same time build a rundown farm into a producing unit for that family, the landlord, and the nation.

These are not theories. They are facts being proved every day on an 80-acre tract 20 miles east of Oklahoma City by Mr. and Mrs. Ralph White, good average Americans, with no more education, no more "breaks," good or bad, than millions get every year.

The Whites moved on this sandy, run-down farm, where the wind had covered the fence posts with once fertile soil, in 1938. The family, including one child, was worse than broke because it owed the Farm Security Administration $199.90 more than it had assets.

At the end of 1942, with the family increased to five, with the figures showing a constantly increasing standard of living paid for, the Whites were out of debt and had assets invoicing at $1,671.03, and the farm had been turned into a producing unit which almost any farmer would gladly rent.

The figures are available, audited by experts, because the Whites operate the Demonstration Farm sponsored by the Oklahoma City Chamber of Commerce to prove that it is possible, with common sense, to solve the twin problems of soil erosion and annual shifting of farm tenant families.

Oklahoma is an oil state. But Oklahoma City business men long ago realized that much of their own profits, and all of their food and fiber, depended upon a profitable agriculture. They promoted livestock shows, fairs, garden and canning contests, terracing, soil conservation projects, the 4-H Clubs and the F.F.A.'s. They worried about soil erosion and tenantry. There were many suggestions. But to Roy Hayman, rural electrification man for the Oklahoma Gas & Electric Co., probably should go the credit for at least one solution. Hayman, quite practically, insists that "no farmer can use electricity unless he can pay for it." So that, too, demanded a sound farmer.

In Oklahoma as in other Southern States, the landlords were blaming the tenants for destroying land and improvements and the tenants were blaming land-

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lords because they couldn't make a living for their families.

Hayman suggested that before either could be satisfied the land would have to be built back. This would help the landlord, and it should be made profitable to the tenant, too. He thought the right kind of a long-term lease would do it.

He and other business men with land experience designed the contract. It provided for usual crop rents. It provided for specific soil building practices, contour farming, plowing under of green manure crops, clearing of timber. And, for building the land, the tenant would get back the landlord's crops for a period of five years.

The search for a farm began. It was one owned by the O. G. & E., itself, Hayman's firm, part of an industrial site with the house occupied by employes and the land handled by annual renters. The soil literally was blowing away.

A tenant then was sought, preferably a young man who would go to some extra work to keep records. The Whites were selected. Both had been to high school and had done some 4-H Club work. White himself is slightly crippled with a stiff ankle caused by an old accident.

The couple was almost whipped by depression, drouth and constant moving. But they wanted to work, if given a chance. They started with those minimum things, a team, a plow, a cow, two dozen hens, and a pig—and a shirt-tail full of furniture. They had assets audited at $363.50 and owed $563.40.

They've finished their first five-year lease. This year they were given another, this time calling for cash to start coming to the landlord, 20% the first year, all of it the last, with the money to be used to build a chicken house and sheds which is paid back to the tenant. It's a good deal, says White, because he needs those improvements to make a larger profit.

That old cow has grown to 17 head. That 2 dozen hens is now 200, with 600 young chickens of high quality strain growing for winter laying. White has managed his own business, raising cotton, watermelons, tomatoes, beans and feed. He could pay cash rent, now, and continue doing just that and building up the landlord's investment.

The Whites have worked, Ralph averaged better than 60 hours a week the year round. But, he grins, that's from the time he leaves the house and gets back—without driving time to a defense plant.

But they lived, too, and perhaps the power use tells that story. Living on a power site they used electricity only for light that

first year. Then came a small radio, then an electric iron, then a washing machine.

An electric pump soon will replace the old windmill to provide water inside the house, and a more continuous supply for livestock around a place where shade trees—welcome in Oklahoma, too—cut off the wind. If he can find the wire, his laying house this winter will be lighted just as the old make-shift garage has been, with plenty of profit.

And, when the war is over, White is going to quit hauling ice. He needs electric refrigeration. And he can pay for it—now. That's a pretty long road in five years for a tenant, isn't it? But it's the result of constantly improving land, which produces more with less work and expense, a profit to the tenant and landlord, the essence of all business success.

Corn Alone for Creep-Fed Lambs

Condensed from The Sheepman

W. P. Garrigus
Chairman, Animal Industry Group, Kentucky Agricultural Experiment Station

THE extension service of the University of Kentucky has for many years advocated creep feeding of spring lambs from the time they will first eat grain—about 10 to 12 days of age—until they have really good pasture. It has been found that lambs handled in this way will make faster and more uniform gains than similar lambs not creep fed.

Since the present demand is for as much meat as possible, produced as economically as possible, interest in creep feeding should be especially keen at the present time.

The Kentucky Agricultural Experiment Station has completed four creep-feeding tests designed to determine whether complex and costly grain mixtures, generally recommended up to this time, will produce results superior to those obtained from corn alone. Members of the Animal Husbandry staff reasoned that good commercial ewes supply their lambs with a goodly quantity of milk, which is, of course, high in protein and minerals. Lambs also have an opportunity to eat some of the legume hay usually fed to the older sheep. Since lambs have these two sources of high protein feed, and since their eating capacity is con-

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siderably limited by their small stomachs, a concentrated fattening feed seems to be most desirable for creep-feeding purposes.

Two rations were tested. One ration was composed of six parts cracked yellow shelled corn, three parts crushed oats, and one part pea-size linseed oilmeal. The second ration was composed entirely of cracked yellow shelled corn. Both rations were available to the lambs at all times in the creeps. The dams of both groups of lambs were of the same age, type, and condition. They were also bred to the same ram and fed identical rations.

In the 1939 test both groups of lambs gained at approximately the same rate but the lambs receiving corn alone consumed slightly less feed than did the other lot. Their costs per unit of gain were, of course, considerably less due to the fact that the corn was less expensive per pound than the mixture.

In the 1940 test, the lambs fed corn alone gained 11 per cent faster than those fed the mixture, while eating 9.2 per cent less feed. Again the corn gains were much the cheaper.

In the 1941 test, both lots of lambs made equally fast gains, but the lambs fed corn alone used slightly less feed per unit of gain than did the lambs fed the mixture.

In the 1942 test, suckling lambs fed to approximately four months of age on the cracked yellow shelled corn gained 17 per cent faster than those fed the mixture but consumed approximately 20 per cent more feed.

In all four tests, it has been noted that the lambs, especially twins, frequently do better on the mixture for the first one or two months. The lambs receiving corn alone, however, soon overtake the other lambs and, for the entire period, frequently outgain them.

At the end of all four tests, the lambs were graded for market desirability. Each year the corn lambs outgraded those that were creep fed the mixture.

The test this year is planned so that both groups of lambs will receive the mixture until they are a month to six weeks of age. One group will then be switched to cracked corn whereas the other group will continue on the mixture.

Under many farm conditions, changing the grain ration of creep-fed lambs may not be practical. The advantage to be gained from such a practice is expected to prove small. Until further results are available,, a sound recommendation seems to be to creep feed cracked yellow shelled corn to the younger lambs and whole yellow shelled corn to the older lambs.

"To Molt or Not to Molt"

Condensed from American Poultry Journal

Louis M. Hurd
(New York)

ONE of the problems of the modern poultry keeper who starts his chicks in mid-winter, is to avoid a serious drop in egg production during the following fall and winter months. Usually the slump in production is preceded or accompanied by a partial or complete molt. Research work and observations by practical poultrymen indicate that there is a relationship between molting and condition of the birds.

If the birds can be kept in the pink of physical condition, there seems less likelihood of a molt developing. Apparently physical condition and molt are influenced by the genetic factor of egg production. In other words, individual birds that inherit the factor of high egg production seem to be more persistent in their production and more resistant to molt. The highest producers will often lay during a considerable part of the time they are in molt.

No one who has studied molt in the domestic fowl has yet been able to state satisfactorily what causes it. Limited evidence available seems to indicate that the endocrine glands play an important part in the process. There is some evidence which shows the molt may be tied up with the activity of the thyroid gland; also, the production of thyroxin by the thyroid gland changes during the year, and this may have an influence on the molt. Since the control of sexual functions is under the direction of the anterior lobe of the pituitary gland, it is impossible to decide whether both of these glands, or one alone, or some other in this chain of glands that has not been studied, is responsible for holding back the molt during the period of sexual activity.

Apparently birds are less likely to molt when the sex glands have reached their maximum activity. When scientists have worked out all the technical problems involved, it will undoubtedly help tremendously in deciding what practices are necessary to delay the onset of the molt.

Observation of any flock of pullets will show a wide variation in the age at which laying

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starts, persistency of lay, and inclination to molt. These variations are largely due to inheritance and environment.

In talking with some of our poultrymen who have been most successful in carrying their January and February hatched pullets through a year of continuous production, I find that they give considerable credit for their success to the breeding of their flocks. In other words, if the pullets come from high producing hens that are late molters and persistent layers, the off-spring of such birds are more likely to perform in the same manner. Possibly such hens have a greater inherited tendency for activity of the hormones which stimulate egg production.

In view of these facts and possibilities, we can safely say that breeding for high egg production is the first requirement in carrying a flock through a year of continuous high production and in staving off a molt.

The second step in preventing a molt is the use of artificial illumination. I find that all the poultrymen who are successful in maintaining production through the winter months place great reliance on the use of artificial illumination. Of course, we know today that the true value of artificial illumination comes from the increased activity of the hormones which stimulate the reproductive organs of the hens. The use of lights, therefore, is in line with the theory already mentioned which indicates that molting is prevented as long as there is considerable stimulation of the reproductive organs. There does not seem to be much difference in the way in which artificial light is provided, just so long as 13 hours of light (including the daylight period) are maintained. A longer day does not increase production, but increases the cost of light and may lead to over-stimulation.

Some of our New York State poultry keepers provide all the light in the morning; others provide some light in the morning and an equal amount in the evening; and occasionally a man uses all-night light. It is likely that all-night lights are the most expensive, especially if more than a 15- or 25-watt electric lamp is used.

Next to breeding and the use of artificial illumination, our successful poultry keepers stress the importance of keeping their birds in good physical condition. There are many ways in which this can be done. But, first of all, the caretaker must be a keen observer and watch how the birds respond to their feed.

In addition to this, many men examine the birds to see how they are holding weight. When pullets first come into production, they

usually have not reached their full body weight. This means they must have sufficient food not only to supply their daily needs in the manufacture of eggs and for body upkeep, but to complete their growth. If the feed supply is not adequate, some of the birds are likely to pause in their production after a few weeks because they do not have enough food to carry out all three assignments mentioned above at the same time. The total amount of feed consumed daily by the birds, then, is a tremendously important point.

On the Cornell experimental farm, it is felt that this factor is probably the *most important one* in connection with the management of feeding. As is to be expected with every increase in egg production, greater amounts of feed are required in just the same way that when more heat is required to heat a building, more fuel is necessary to produce the heat. Furthermore, if steady production is desired, the intake of feed must be regular. The following table shows the approximate number of pounds of feed required daily by 100 birds at different levels of egg production. To keep this intake from varying once the birds have reached a certain level of production, special feeding practices are resorted to, such as the feeding of wet mash, pellets, or milk.

Approximate Daily Amount of Feed for 100 Laying Birds

(Light breeds averaging 4 lbs.; heavy breeds averaging 5½ lbs.)

% Production	Light Breeds Lbs.	Heavy Breeds Lbs.
30	22	25
40	23	26
50	24	27
60	25	28
70	26	29
80	27	30

One man whom I know very well follows the practice during cold weather of pouring warm water on top of the dry mash in the feeders twice a day. At the same time, a close check is made of feed consumption. This, together with water warmers and artificial light, produces excellent results. This man reported no trouble with molting with February hatched pullets last winter.

Quite a number of poultrymen use pellets in place of wet mash or to supplement the wet mash feeding. And occasionally liquid skim milk is used either as a drink or in mixing the wet mash.

One of our poultrymen says he has the best luck in maintaining high egg production when the protein for the ration (grain and mash combined) runs about 16%. To encourage a maximum intake of feed, it is essential to have ample mash feeding space. Some of our poultrymen insist that there be enough feeding space so that all the birds can eat

at one time. The minimum amount of hopper space recommended by the Poultry Department at Cornell is 12 linear feet per 100 birds where the birds eat from both sides. More mash consumption will result if the mash feeder is at a convenient height above the floor. This is particularly true of the heavy breeders. The best location is just high enough so litter will not be scratched into the feed.

Fresh feed daily encourages consumption. One of our men allows the dry mash feeders to become empty for an hour or less daily. He feels that this encourages consumption. Of course, this plan calls for very close supervision. But I cite it since it is one of the small points of value in the management of the laying flock.

In conclusion, the final step in the management of a flock seems to be the ventilation and insulation of the building. Most of the poultrymen whom I have visited give this considerable weight. In cold weather, a poorly ventilated and insulated house is likely to result in considerable discomfort for the birds. The litter becomes damp and the atmosphere clammy and uncomfortable. In extremely cold weather, such as experienced in New York State last winter, the combs of some birds were frozen in poorly ventilated and insulated houses. This is bound to result in a drop in egg production.

Data collected some years ago on the College farm at Cornell indicate that in a building where the temperature during extreme weather is considerably below freezing, the food intake is very likely to decline. Egg production may not be affected on the coldest days, but will be affected soon after the cold spell unless special attention is given to the feeding. Even then, this may not be enough to hold the production of the birds. In addition, the regular practices that are followed to maintain dry litter are very helpful in maintaining production.

The Answer to the Testing Problem

Condensed from Successful Farming

Niemen Hoveland

University of Wisconsin

IT'S no secret that dairy-herd-improvement work is running into trouble because qualified testers are hard to find in wartime. But, cheerfully ignoring that, 11 Wisconsin counties are testing *three* times as many cows as in prewar days.

Back of the miracle lies a plan that promises to revolutionize herd improvement in peace as in war. Wisconsin is fast abandoning local associations and organizing county-wide co-operatives to do the testing in central laboratories.

Unlike "mail order" testing organizations, the new county co-ops offer any kind of testing the farmer wants: standard DHIA, bi-monthly, advanced registry, or —at about half price—the owner-sampler plan under which the dairyman takes his own milk samples and weights.

This story begins in 1939, when R. C. Heffernan, Winnebago County Agricultural Agent, wrote a griping letter to E. E. Heizer, newly appointed chairman of the dairy husbandry department of the University of Wisconsin.

"I'm disappointed with herd-improvement work," was the burden of Heffernan's letter. "Why can't we organize it so more farmers get the benefits of testing?"

That was right up Heizer's alley. He knew of West Coast ventures into central testing, and told Heffernan about these set-ups. He pulled wires to have a group of extension men sent west to learn more—and then Wisconsin built on from there.

As of June 1 this year, half of Wisconsin's testing was done in central laboratories. The swing is so marked that Heizer predicts more than 90 percent of the state's testing will be done in labs by 1944. Now Heffernan, after three years of experience with county testing, doesn't gripe about herd-improvement work.

In the first place, one fieldman serves 65 to 100 or more farmers in county co-ops, instead of a maximum of 26 as in local associations. Two results from that: Co-ops can pay fieldman enough to keep them on the job without charging higher fees than local associations, and draft boards

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have proved far more willing to defer fieldmen serving 100 farmers than those reaching only 26.

Fieldmen can serve more members under the county setup partly because the co-operatives hire women to do most of the laboratory work, milk testing, and bookkeeping. Another reason county co-op fieldmen reach more farmers is that at least two-thirds of the members take their own milk samples and weights. The fieldman doesn't have to be there.

It works this way: The first thing a fieldman does when he goes out on his afternoon trip is leave sample bottles with two or more owner-sampler members. Then he goes on to a nearby farmer who does standard testing. The next morning he picks up the owner-sampler bottles on his way back to the lab.

Like other members, owner-sampler farmers get quick reports on tests, with recommendations on how to feed each cow according to her butterfat production. Fieldmen also talk over individual problems.

Owner-sampler records are not publicized, so they're no help in selling stock. Nor are they used in proving sires. But these records are as valuable as any to dairymen who are simply interested in feeding efficiently and improving their herds. Contact with a fieldman is helpful, too—that's an important advantage this system has over mail testing.

The best evidence that owner-sampler testing works is this: A high proportion of new members gets a 20 percent increase in milk production within three months.

As for the cost, Dodge County rates are typical: On the owner-sampler plan, $15 a year for 10 cows or less, plus eight cents a month for each cow over 10. For standard testing, $30 a year for 10 cows or less, and 10 cents a month for each additional cow. Dodge offers a five percent discount for payment yearly in advance.

Dodge County, with 16 percent of its cows on test after a year of contract testing, has five fieldmen and three women serving 450 dairymen. If those farmers were organized into local associations of 25 members each, they would need 18 fieldmen—and those 18 would run up three times as much mileage as the present five.

County co-ops are going over well for a number of reasons aside from solving the fieldman shortage and testing at low prices. Farmers name these advantages:

1. Fieldmen have more time to help with feeding, breeding, and sanitation problems when they are free of testing and book work.

2. Farm wives like the fact that in most cases they don't have to furnish board and room for the fieldman. In some co-ops the

fieldman stays with those who do standard testing, but in most areas he goes home at night.

3. Laboratory testing is highly accurate, as well as fast and labor-saving.

4. Co-ops can afford calculating machines, which produce more reliable records than human ciphering—and fast.

5. The co-operatives keep complete records on file right at home, where they're handy when someone wants to buy breeding stock.

How to go about setting up a county co-operative? Let's see what Jefferson did — it's quite typical of procedure followed.

Early in 1943, Jefferson County's three local associations found themselves without testers. Some of the dairymen thought a county co-op might be the way out, and County Agent George Wright talked it up. Presidents of the associations served as a committee to investigate. The committee did a bit of traveling to learn how co-ops were working in nearby counties.

Prospects looked good. So with members of the old associations as a nucleus, farmers went ahead and organized under the co-operative laws of Wisconsin. They elected a president, secretary, and treasurer, as well as a board of directors, made up of two members from each of the old associations. New members were secured.

The newborn co-operative worked out a schedule of fees. It arranged to insure prospective employees. It decided on salaries that could be paid, and the county agent looked for competent help.

The county board not only granted rent-free use of a basement room in the courthouse, but footed a bill of some $500 for lumber, piping, sinks, carpentry, and plumbing work to put the room into shape. The lab was planned to avoid waste motion. Work tables, tempering bath, acid-resisting sink, washing-up sink, draining board, power-driven Babcock tester—everything was placed where it should be.

In most counties, testing associations take the lead in organizing the county co-operative. But in Green and Langlade it was artificial breeding rings that launched central testing. In some localities the fieldmen do no testing and little book work, but in others they help with both. Although most co-ops keep a balance of two owner-sampler members to one on standard testing, Polk County has a dozen owner-samplers to each standard.

The Green and Dodge co-ops are also testing milk for cheese factories, charging 10 cents a sample. This satisfies farmers

that their milk is correctly tested, and it brings the co-ops extra revenue.

The fact that dairymen now find it easy to pay fees has something to do with the current Wisconsin enthusiasm for county co-operatives, which are able to carry on while many local associations fold up. But the prevailing opinion in counties that have it seems to be that central testing was destined to come and is here to stay.

Dairy Practices for War-Time Efficiency

Condensed from The Ohio Farmer

E. W. McMunn

EMERGENCY feeding schedules, control of milk fever, grass silage, pasture improvement, artificial insemination, and raising calves on a limited amount of milk—all these are subjects of interest to dairymen engaged in wartime milk production. Dairy specialists and others gathered for a day at the Ohio Experiment Station where they heard Dr. W. E. Krauss, chief of the dairy department, and his coworkers tell of latest experimental progress in all of these fields.

Preservation of the roughage crop has always been a major problem on Ohio dairy farms. Many dairymen have turned to grass silage as the best storage method for early hay, especially in wet seasons. But at Wooster members of the dairy department, in cooperation with agricultural engineers from Ohio State University, have installed a fan and a series of flues in one of the barns and have succeeded in making dry hay of good quality even when it went into the mow with as much as 50 percent moisture.

Using the new flue-curing method a second cutting of alfalfa was mowed in the field between 8:30 and 11:00 a. m. and hauling to the barn was started at 3:30 the same afternoon. This crop was cured in the mow and is now high quality hay. Another field, cut about the same time and cured in the field, was almost a total loss because of rain. Since most of the protein, minerals and vitamins in hay are found in the leaves, this mow-drying method conserves valuable nutrients because of the fact that leaf-shattering is avoided.

The usual and best method of raising dairy calves is to feed whole milk and skim milk together with grain and hay. But, as pointed out by W. E. Krauss, during periods when milk is at

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at a premium good calves may be raised on a very restricted amount of milk. For instance, changing all calves over to a dry feeding program during the war-time period would release at least 500 million pounds of whole milk and 2½ billion pounds of skim milk for human consumption.

Steps in the limited milk method of calf feeding follow:

1. Allow calves to suckle their dams one to four days.

2. Pail-feed small quantities of whole milk three times a day for a week.

3. Continue whole milk feeding according to the following schedule:

	Large Breeds Lbs./day	Small Breeds Lbs./day
Balance of first week	8	5
Second week	9	6
Third week	10	7
Fourth week	9	7
Fifth week	7	6
Sixth week	6	6
Seventh week	4	5
Eighth week	—	4
Ninth week	—	3
Tenth week	—	3

4. Feed two teaspoonfuls of fish liver oil or ½ teaspoonful of fish liver oil concentrate daily for the first six weeks, especially during the winter. This supplies vitamins A and D.

5. Offer a dairy feed mixture starting when the calf is 10 days and continuing for 16 weeks, when the calf should be taking about four pounds. A suggested feed mixture is:

	Percent
Grains (corn, oats, barley, etc.)	35-45
Bran and middlings	15-25
Linseed oil meal	10
Soybean oil meal	18-20
Alfalfa leaf meal	2- 5
Minerals (calcium and phosphorus)	1- 2
Salt (iodized)	1
Irradiated yeast	.5 to 1 pound per ton

6. Change to a simpler grain mixture that can be continued until freshening time.

7. Keep clean, bright mixed or straight legume hay in a rack before the calves at all times, starting when they are 10 days old.

8. Keep water before them at all times. Be certain they are drinking water at the time liquid milk feeding stops.

Dairymen with scabby wheat, suitable only for feeding, will find comfort in results from the Ohio Station showing that this wheat may be fed to dairy cows without harmful effects. In feeding trials screenings from scabby wheat were used and probably at higher rates than would be found in field-run grain. Other work in feeding wheat shows that it may be safely fed to dairy cows and on a weight basis is equivalent to ground shelled corn in feeding value.

Shortages of concentrate feeds may force some dairymen to re-

vise usual feeding schedules and even leave out certain grains or protein supplements entirely. During recent years C. F. Monroe and others at Wooster have been comparing simple and complex rations and find that where two rations contain approximately the same amount of protein and total digestible nutrients, that there is little difference in production. Thus they found that satisfactory and profitable production can be maintained on a number of different rations and combinations of feeds.

In one test on 28 Holsteins at the Grafton State Farm, the group fed a simple ration of corn and soybean oil meal produced an average per month of 1224 pounds of milk and 37.4 pounds of fat. In the same test, cows fed a complex ration of corn, soybean oil meal, oats, bran, linseed oil meal, beet pulp and molasses, averaged 1198 pounds of milk and 37.5 pounds of fat. Legume hay and corn silage were fed to all the cows in this test. A similar experiment, using cows on pasture, showed results about the same as when conducted under winter feeding conditions.

Experimental work with grass silage has been a part of the program of the dairy department at Wooster for a number of years. Here, during the past two seasons, forage used in the grass silage studies has been harvested with a special field forage harvester, which, when it becomes generally available, may be used for a variety of purposes such as grass silage making, clipping pastures, and putting up corn silage.

In a special building containing 23 experimental silos, C. F. Rogers, C. F. Monroe, A. E. Perkins and others have studied various methods of grass silage making and these trials show that such expensive and hard-to-get materials as molasses and phosphoric acid are not needed to make good grass silage. These trials indicate that cows prefer drier silages to the wetter ones, that wet silages to which preservatives such as shelled corn, corn-and-cob meal, ground wheat or whole oats have been added are preferred, and that silage to which beet pulp has been added as a preservative is a delicacy in comparison with other silages. In general, it has been found that better silage results when at least 30 percent dry matter is present.

After two years of study, feeding of irradiated yeast offers some value in the prevention of milk fever, especially in Jerseys, according to work reported by J. W. Hibbs. In Jerseys, the breed where the disease occurs most commonly, cows fed one million units of vitamin D in the form of irradiated yeast daily for four weeks before and one week fol-

lowing freshening had only half the frequency of milk fever as did a control group not receiving the yeast. Jerseys with previous histories of milk fever had an 83.5 percent incidence of this disease, whereas in yeast-fed animals the incidence was only 17.7 percent. At present there is insufficient data from which to draw conclusions for the other breeds, but for Jersey breeders with some cows prone to this trouble, this method of prevention offers distinct hope.

Visitors to the 60-acre pasture farm at the Experiment Station saw three different pasture methods that have been under comparison for the past two years. Results here show the value of improving bluegrass pastures with applications of lime and fertilizer. This has been a good year for clover and it is much in evidence on the improved pastures. A two-acre untreated bluegrass pasture offered a marked contrast to a new seeding of legumes in an adjoining field. At this pasture farm, cows, even on good pasture plots, show a desire for some hay as a supplement even when there is an apparent abundance of pasture.

Know Your Sows

Condensed from American Hampshire Herdsman

Prof. W. E. Carroll
University of Illinois

BEFORE progress can be made toward greater practical utility of swine, satisfactory methods of measuring that progress must be developed. Everyone would doubtless agree that to increase the rate and economy of gain of swine in general would be desirable, but few long-time breeding programs have been devoted to attaining that goal. The most outstanding attempt which has been made to improve the utility value of swine is the Danish system of swine improvement. In this system certain minimum production is required of a sow, and her pigs must perform acceptably in the feedlot and produce carcasses of a given standard of excellence.

This performance is measured by sending four pigs of a litter at weaning time to a central testing station where they are fed as a group to "bacon weights." When finished, the two barrows and one of the gilts are sent to a bacon factory where slaughter and cut-out tests are made on each ani-

mal. The breeder, if he desires, may retain one gilt out of the test pen to put in his breeding herd. The program is believed to have been an important factor in the improvement of Danish swine during the last 40 years.

The Danish system has not appealed to the swine growers of the United States probably because it has appeared rather too complicated to fit the needs in this country. Denmark is, of course, small compared with the United States and normally has fewer hogs than may be found in a single state here. The British market has dictated the type, weight and finish of Danish hogs and the method of cutting and curing the carcass. This demand has been for a standard product, known as the Wiltshire side, the specifications of which have remained remarkably constant. In contrast, hogs of widely different type, weight and finish are required to meet the demand which exists for the products of the American hog. Measures of improvement are naturally more difficult to apply to diverse than to simple situations.

Any method of swine improvement to be useful in this country must be applicable to large numbers of animals and to varied conditions, and it must be simple. For the time being, at any rate, success appears most likely to result from a plan which is concerned chiefly with production and herd management phases rather than with marketing and standardization of product.

The Registry of Merit system which Hampshire Swine Registry has developed has most of the features essential to a successful breed improvement program. The plan stresses factors of definite economic importance, is simple, applicable to large numbers, and can be adapted to almost any set of conditions likely to be found on American farms. Enough observations have been made of its effectiveness to demonstrate the fact that it has definite possibilities for herd and breed improvement.

In at least one area where such a system has been in operation for about five years, the demand for breeding stock from tested animals is strong and at prices definitely above prices which are paid for untested stock. The increased sale value of tested breeding stock should not be emphasized too strongly. That is valuable, of course, but of much greater consequence is the increased productivity of the entire herd which should come from continued selection of high production.

Some of the by-products of the Registry of Merit program are likely to prove as valuable as the program itself to those who follow it. The program is designed

to develop good, consistent, dependable breeding animals. To succeed with this plan will require careful sanitation, the feeding of well-balanced rations, and the application of good management practices to the enterprise—and these are the fundamentals of successful swine production.

Factors Influencing the Persistency of Lactation

Condensed from Guernsey Breeders' Journal

C. W. Turner
University of Missouri

WITH the possibility of milk rationing, every dairyman is interested in keeping his cows producing at a maximum this fall and winter. Breeders who have had cows on Advanced Register test have learned a good many of the factors which influence the persistency of lactation, but some of the underlying principles of milk secretion which have been developed in recent years may clear up some of the "whys and wherefores."

If you were to take the average monthly milk production of your 10 best yearly producing cows and plot them on a piece of graph paper, you would note that the milk production increases gradually for a month or two until it reaches a peak, then gradually declines until the cows are dry. If now you would plot, similarly, the average monthly production of your 10 poorest yearly producing cows, you would note a number of differences in the shape of the two curves of production.

It is quite probable that the better cows would show an increase in milk production for a longer time, reach a higher maximum milk production, and decline in production slower or be more persistent. How much of the difference in the two curves is due to the inheritance for high milk and fat production and how much is due to feeding and management is an open question. There can be no question that inheritance limits the production of many cows receiving good feed and management and contrary-wise the feeding and management received limits the production of many cows with an inheritance for high production. In a practical way this all adds

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up to the fact that the better cow, i.e., the cow with an inheritance for high production, will be able to take better advantage of good feeding and management practices and will show a better response in milk production. For this reason breeders must continually strive to improve the inheritance of their cattle for high milk and fat production. They have the added responsibility, however, of being good cow men, for only by understanding the best methods of feeding and management and good milking practices can they obtain success.

The rise in milk production has been variously explained as being due to the general improvement in the condition of the animal after parturition, to the increasing consumption of food, and to a lactation inhibiting hormone which is present during pregnancy but is eliminated in the urine after calving.

A more probable explanation based upon recent study of the hormones secreted by the pituitary, thyroid, and other glands of internal secretion lies in the increased secretory activity of these glands in the production of hormones which are known to stimulate milk secretion. With these hormones being produced at a high level, the appetite is improved, resulting in increased feed consumption and greater availability in the blood of the constituents which go to form milk.

When cows freshen in good condition, are milked frequently so the pressure of the milk in the udder does not inhibit milk formation during the interval between milking, and are well fed, the rise in milk yield may continue for one to two months and in a few cows even longer. The amount of milk produced per day during the month of maximum production may be considered a good measure of the capacity of the size of the udder. This capacity is due to the inheritance of udder size, but the way the inheritance is expressed has only recently been discovered at the Missouri Station. It has been found that a certain hormone is produced in the pituitary, a small gland located at the base of the brain, during pregnancy which causes the growth of the udder. At each succeeding pregnancy further growth of the udder occurs thus causing in part the increasing production of milk at each lactation period.

Following the period of maximum production in cattle, the rate of milk secretion begins to decline. It has been observed that some cows decline only slightly from month to month, while other cows decline rapidly going dry within a few months after

calving. The term *persistency of lactation* is used to describe the degree with which the rate of secretion is maintained. The question is frequently asked in regard to the heritability of this character. Is the rate of decline in milk production controlled by environmental factors or do some cows inherit high persistency and other cows low persistency. There are many reasons to believe that this important characteristic of the most productive dairy cows is inherited, yet the great influence which environment exerts upon the production of milk makes difficult at times the demonstration of the inheritance received.

The most convincing evidence in favor of the heritability of persistency comes from the fact that even under the best conditions of feeding and management, there are great differences in the rate of decline of milk production of individual cows. Scrub and beef cattle, notorious for their low milk yielding capacity, cannot be kept up in their milk production even when well fed. They go down in milk yield quickly and the surplus feed consumed is converted to body fat.

When such cows are bred to dairy sires, their progeny show increasing dairy capacity not only yielding more milk at the maximum but more sustained milk production as well. However, there is a relation between the height at the maximum and persistency and cows yielding large amounts of milk at the maximum have difficulty in maintaining that level, whereas cows with a low maximum have less difficulty and consequently may be very persistent. Within the pure breeds, it has been found that on the average, there is an inverse relation between maximum milk yield and persistency. However, in individual cases these two factors may either go together or the cows may possess one or the other characters separately.

When many records of dairy cows are considered together so that individual fluctuations are smoothed out, it has been observed in studies made at the Missouri Station that the decline of milk secretion follows a very regular and predictable course. Stated in simple terms, the law of persistency indicates that when all other factors are constant the decline in milk secretion per month (or other unit of time) is a constant percentage of the previous month's production. In the case of individual cows considerable variation may be expected, but when cows are kept under good conditions of feeding and management the uniformity in the decline is remarkable. For dairymen who wish to watch the

productivity of their cows from month to month, normal curves of lactation for various levels of daily production have been prepared. By comparing the milk actually produced with the normal curve, it is possible to tell whether individual cows are following the normal trend. If at any time there is a more rapid decline in milk flow, it will show itself and the cause of the trouble may be determined. If the trend is followed, the total production may be rather closely estimated.

A number of factors have been investigated to determine their influence upon persistency of lactation. The season of the year has been observed to influence the rate of milk secretion. This may be due in part to variations in pasture conditions in the summer and also to temperature and humidity fluctuations. In a study of cows in Illinois D. H. I. A., it was observed that the cows calving in the winter months started at a relatively high level, showed more than the average degree of persistency through June and then fell off in yield very rapidly. Uniformly, where the month of June fell near the middle of the lactation curve, it represented a turning point and was followed by a very rapid falling off in rate of yield.

A number of investigators have shown quite conclusively that the persistency of cattle is greatest during the first lactation period. There follows during the next several lactations a gradual fall in persistency. Therefore, the persistency of cows of various ages cannot be directly compared. The differences observed appear to be due to the greater height of the maximum yield of the older animals.

Under normal conditions dairy cattle are expected to calve at approximately yearly intervals. For this reason pregnancy and lactaton must go on simultaneously during a considerable part of the year. To determine the influence of pregnancy upon persistency, a study was made at this Station of the rate of decline of two groups of dairy cattle. The first group was not bred during the entire lactation period, whereas the second group was bred the third and fourth months of lactation. For five months after the cows were bred the two groups declined about the same rate, but during the last four months of pregnancy, the milk yield of the pregnant cows dropped off more rapidly. However, the total decrease amounted, on the average, to about 500 lbs. of milk. There is increasing evidence in favor of breeding dairy cattle as soon as they come in heat after calving as pregnancy does not place a heavy drain on the lactating cow and the short calving interval will maintain lactation at the highest

average level considered on a lifetime basis.

The favorable influence on persistency of frequent milking has been demonstrated by several investigators. As cows are changed from two or three or four milkings per day, the rate of decline in yield is slowed up and when the reverse change is made persistency is decreased.

The effect of machine milking upon persistency is a common question. Several careful studies have recently been reported covering comparisons of the same cows for entire lactation periods. In an experiment in this country, the monthly fat production records for the first three months were rather similar, but beginning with the fourth month the cows which were milked by hand maintained a higher level of production. In England the observations were quite similar. At the fifth week after calving the two groups were equal. The difference between the two groups gradually increased during the advance of lactation and by the 30th week after calving the hand-milked group yielded an average of 25.5 lbs. more milk per week per cow than their machine milked controls. This difference was significant and it was concluded that the machines or something associated with them induced the cows to be less persistent in milk secretion. From experiments in Denmark, it was concluded that hand-milked cows would yield more milk than machine milked cows, due primarily to the slower rate of decline with advance of lactation in the former group. These experiments should not be taken to indicate that cows should not be milked by machine, but rather that greater care must be observed in maintaining lactation in such animals.

The most important factor in maintaining the persistency of lactation is the feed supply. For short periods, milk will be secreted at the expense of the body reserve but very soon the balance between intake of food and milk yield will reach an equilibrium. As a result, reductions in milk yield are usually caused by improper balance or amount of feed. When cows are on pasture, the decrease in yield is frequently caused in part by a reduction in the feed available rather than due to flies. The other factor which may reduce milk and fat production is prolonged hot weather.

It is usually said that nothing can be done about the inheritance which an animal receives. That is not entirely true. The inheritance for high milk and fat production is dependent upon the rate of secretion of certain endocrine glands which stimulate the growth of the udder during pregnancy and the lactation process

after parturition. Recent research indicates that the hormone secreted by the thyroid gland stimulates increased milk and fat secretion. This may be interpreted as indicating that the inheritance for thyroid gland secretion was less than optimal in those animals which show a response by increased milk secretion.

Recently, at the Missouri Station, a process has been developed for producing the hormone of the thyroid gland synthetically so that it is now feasible to feed milking cows this preparation due to a reduction in cost of this thyroid substance. Of 27 cows in the declining stage of lactation when thyroprotein feeding was started, 23 cows showed increases in milk production ranging from 6.6 per cent to 60.8 per cent after six days or more of thyroprotein feeding. The average increase in milk production for the 27 cows was 18.6 per cent. The continued feeding of thyroprotein decreased the rate of decline of milk secretion over the course of several months during which time this preparation has been fed.

Not only is the milk yield stimulated, but there is an increase in the fat test of the milk. This is the first substance to be discovered which can be added to the feed and cause a consistent increase in the fat test of milk. It would appear also that the natural inheritance for a given level of milk production can be altered upward in two ways by thyroprotein feeding, first, by increasing the level of milk secretion and, second, by increasing the persistency of milk secretion.

In summary, it may be considered that each diary cow inherits a definite type of lactation curve representing increasing milk secretion up to a maximum yield. The maximum yield of milk indicates the extent of growth of the udder secretory tissue. Following the peak of production, there is a gradual decline in milk yield or persistency of secretion. The rate of this decline may also be considered to be inherited but recent endocrine studies indicate that the decline in the secretion of certain hormones including the lactogenic hormone of the pituitary and thyroxine from the thyroid gland regulate in part this decline in milk production. If lactogenic hormone or the thyroid hormone are administered, the persistency of milk secretion is increased. While good management feeding, and milking practice can aid in holding milk secretion up to the inherited maximum, a surplus of feed will not be utilized for milk production, but will increase the body weight.

For these reasons a combination of good breeding (the cow) and good management (the herdsman) are required in these times of milk shortage.

How Safe Are You Afield?

Myra Carr

The Answers are on Page 84

1. Which of these snakes are poisonous?

   a. Coral Snake
   b. Water Moccasin
   c. Hog Nose
   d. Pilot Black Snake
   e. Rattlesnake
   f. Copperhead

2. If caught in a storm, for safety's sake you should

   a. Run for the nearest tree
   b. Try to reach a cave or a depression
   c. Make for a hilltop

3. How would you recognize the only poisonous lizard inhabiting the U. S. A.?

   a. A skin studded with tubercles like nailheads in pink and black.
   b. A laterally compressed body, and the power of changing the color of the skin.
   c. A small body and toes with adhesive disks.

4. Poison-ivy may affect the skin even in winter. (True or False?)

5. The pain from a sting of a bee is caused by

   a. Barbs on sides of the stinger
   b. Injection of a powerful acid

6. Of the plants listed check four that are dangerous to put in the mouth—

   Jack-in-the-Pulpit
   Sweet Marjoram
   Larkspur
   Fringed Gentian
   Wild Cherry
   Jimson-Weed

7. Is the Rocky Mountain Wood Tick the only carrier or vector of the germ spotted fever?

8. A good emergency treatment for heat exhaustion is

   a. Apply cold water to the head and chest
   b. Give hot coffee or tea

9. Chiggers have not been shown to carry disease. (True or False?)

10. Which description fits the Black Widow Spider whose bite is often fatal?

    a. A great furry black body and four pairs of long legs covered with fine black hairs. Six or seven inches across legs.

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b. A black shiny body, small head, large smooth abdomen with brilliant red triangular markings that may resemble an hourglass.

c. Big gray plump abdomen and feelers four inches long. Moves with sidewise motion.

11. Check the animals listed that are proved carriers of tularemia.

a. Quail
b. Red fox
c. Chicken
d. Wild Goose
e. Otter
f. Muskrat

12. The sting of a nettle comes from

a. An irritant fluid
b. Pointed hairs

13. Immediately after a porcupine is killed its spines lose their penetrative powers. (True or False?)

14. Which of these American mushrooms would prove safe eating?

a. Beefsteak
b. Morel
c. Red-Milk
d. Stinkhorn
e. Oyster
f. Fly Mushroom
g. Coral Fungus
h. Meadow Toadstool

15. Could you expect the "Whip-tailed scorpion to sting or bite you?

16. Male deer, elk or moose are dangerous with their antlers in the Spring, Summer, Fall, Winter.

17. Do bats really tangle themselves in a person's hair? (True or False?)

18. You could get bubonic plague from the bite of a Rat, Flea, Tsetse-fly.

19. Skunks carry hydrophobia. (True or False?)

20. Which statements truly describe the Deady Nightshade, that poisonous relative of the potato.

a. Has flowers in the form of dull purple bells produced singly
b. Has white flowers in small clusters
c. Has brilliant orange colored berries
d. Has big tempting cherry-like berries

New Culling Methods

Condensed from The Poultry Tribune

J. H. Florea

CULLING simply means the sorting out of non-laying or unprofitable birds from the flock.

This year, with a scarcity of feed, labor and equipment putting a limit on the number of birds which can be kept, proper culling becomes more important than ever.

Only those hens which lay well should be given housing space and feed. Dr. M. A. Jull, University of Maryland, has pointed out that a 5-lb. hen laying 100 eggs a year requires more than 8 lbs. of feed per dozen eggs laid; whereas a hen laying 200 eggs a year requires only about 4½ lbs. of feed per dozen.

Culling should be done throughout the year, but it is especially important in late summer and fall, when there are young pullets to house and hens to dispose of.

With the laying flock population already the highest on record and probably 15 percent more young pullets being grown this year than last, poultry raisers have a greater opportunity than usual to make a careful selection of the pullets which they place in laying houses this fall. There should be no need to house poor pullets.

Each pullet to be placed in the laying house should be vigorous and healthy and have a sound body. Vigor and health are indicated by bright, clear eyes, a well developed body, and an active disposition. There should be no physical defects, such as a crooked beak, which would prevent the bird from securing an abundance of feed.

One question in connection with pullets is what to do with those having crooked breast bones. While it is desirable to have the breast bone long and straight, yet the evidence indicates that a crooked breast bone does not result in lower egg production.

Characteristics of the head are valuable, not only in selecting pullets, but also in culling laying hens. The head should be clean cut and well balanced, of medium length and depth, wide and flat across the top of the skull. The eyes should be large, bright and prominent. The skin covering the face should be smooth and lean.

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Especially avoid birds with a "snaky" appearance or "crow headed."

Some indication of a hen's ability to use large amounts of feed efficiently can be secured by the size and capacity of body. The back of a good bird should be wide for its entire length and free from hard fat. The ribs should be well sprung, allowing room for the heart and lungs.

An extremely important characteristic to note in pullets, particularly if they may be used for breeders in their second year, is that of age at sexual maturity, or age when they begin laying. Early sexual maturity is one of the five important separate genetic or breeding factors which has been shown to be largely responsible for a bird's annual egg production. Those pullets which are extremely early in maturity should be avoided, but aside from these few precocious birds in about every flock, early sexual maturity is very desirable. If, at housing time, the pullets showing

Characteristics Identifying Layers and Nonlayers

Character	Condition in a— Layer	Nonlayer
Comb	Large, bright red, smooth, glossy	Dull, dry, shriveled, scaly
Face	Bright red	Yellow tint
Vent	Enlarged, smooth, moist	Shrunken, puckered, dry
Pubic bones	Thin, pliable, spread apart	Blunt, rigid, close together
Abdomen	Expanded, soft, pliable	Contracted, hard, fleshy
Lateral processes	Prominent, pliable	Hard to find, stiff
Skin	Soft, loose	Thick, underlaid with fat

Characteristics Indicating Whether Previous Production Was Continuous or Brief

Character	Condition associated with— Continuous Laying	Brief Laying
Vent	Bluish white	Yellow tint or flesh color
Eye ring and ear lobe	White	Tinted with yellow
Beak	White	Tinted with yellow
Shanks	White, rather flattened	Yellow, round
Plumage	Worn, soiled	Not much worn
Molting	Late, rapid	Early, slow

Characteristics of a High-Laying Strain

Time of maturity	Laying begins at about 6 months of age in the case of Leghorns and at about 7 months in the case of Rhode Island Reds, Plymouth Rocks, and similar breeds.
Rate of production	Average of 180 or more eggs a year.
Broodiness	Birds are seldom broody.
Persistence of production	Hens are laying well in August and September toward the end of the first laying year or after it is completed.

this characteristic are given a leg band of distinctive color, it will be helpful in selecting breeders the following year.

In culling mature hens, the same factors in regard to head characters, health and body capacity should be noted as in culling pullets.

In addition, however, an important consideration in hens is the present stage of production, as indicated by pigmentation, molting and general appearance.

The chart gives in condensed form the points to be considered in selecting the best producers.

Naturally the best way of culling a flock for egg production is by trapnesting, but this is too expensive in most flocks and is not necessary.

There are five genetic factors largely responsible for a bird's production. The first of these, early sexual maturity, should be noted when the pullets are put into the laying house. A second, broodiness, can be noted during the winter. Hens which go broody should be marked with another band.

A third, persistency, is determined at this summer or fall culling, and means the length of time which the hen lays at a fair rate. Hens which lay late into the fall should be marked with still another colored band. In each flock, select the hens which lay longest, but, in general, hens which are still laying in September are good ones.

So, without trapnesting, a poultry raiser can have a pretty fair knowledge of three of these five characters about his hens. This will be of great aid in selecting breeding birds. The other two, freedom from winter pause and high intensity or rate of production, really can be determined accurately only by trapnesting.

While these methods of culling hens for egg production by their external appearance have been in use for 25 years, a further improvement in culling methods, through examination for internal abnormalities, has been developed more recently and is increasing in popularity.

When birds are found normal as far as external appearance is concerned, they are then examined internally to determine further their state of health and laying ability. This is done by inserting the finger into the cloaca of the bird and examining the organs of reproduction, the digestive tract and its accessory organs, to determine their state of development and physical condition. The technician who has been properly trained to recognize what he feels can detect tubercular lesions of the intestines, liver and spleen, as well as blighted ovaries and other abnormal organs, and can locate tumors.

The use of this method twice a year also makes it possible to take out many birds which would undergo physical breakdowns within a short time. This means a saving in feed and an increase in the returns from market birds.

While this method is safe only when used by a trained expert, yet the rapid increase in the number of hatchery flock inspectors and other poultry service workers who have been trained in this method in recent years makes it rather widely available.

Starting a Beef Herd

Condensed from The Shorthorn World

Paul Swaffar
Blacksburg, Va.

NEW herd owners are of various kinds. Some are the few-acre dirt farmers bent on improving their soil and diversifying their farm management, some are wealthy, landed plantation owners, and some are businessmen, seeking a place to safely invest a few dollars.

If you happen to be one of those newcomers in the breeding business, there are a few things you ought to know before you go further. You ought to know, for instance, that breeding cattle is no child's game, but instead a tough, highly competitive, specialized business, requiring skill, patience and sound judgment. To be successful, a breeder must have at least a common understanding of genetics, animal nutrition, agronomy and salesmanship.

No agricultural business in the world holds as much promise for accomplishment and none approaches the breeding of registered cattle as a source of genuine pride and interest. Men have spent a lifetime developing a small herd of registered cattle, and some herds have taken the life-times of several men to perfect.

So, to you who happen to be starting a new herd, I suggest you study the ways and means of those breeders who are a proven success.

I can think of no better example than the outstanding example of all, the Scotch farmer, Amos Cruickshank — premier builder of his day, perhaps of all time.

What makes Cruickshank a name long remembered when others of his day were soon forgotten? What did he demand in his

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cattle that made them sought after the world over? What methods did he use in starting and developing a herd of cattle, a herd outshone by none? Find the answers to these questions, and you've found, I believe, the reasons for success or failure in nine out of ten cases.

First of all, Cruickshank recognized that the purpose and value of a cow lay in her ability to consume feed and to convert that feed into beef. He had no fancy rations—hay, straw, grass, and roots were his crops. To be worthy of a place in his famous herd, an animal had to consume those feeds in huge quantities and to convert them into beef—into pounds of beef. Beauty of conformation meant nothing, and popularity of pedigree meant less, without the fact that the animal could eat and produce. To Cruickshank, the most beautiful animal was the one with the greatest appetite, the biggest middle and with the ability to use that appetite and that middle for profitable gain.

Here then is, I think, the first lesson for the new breeder. Market demands have changed since Cruickshank's day, bringing about a quicker maturing, smaller sized market animal and a "neater" package, but cattle needs have changed little—it's still grass and hay and grain. Appetites and quick pounds are as important today, perhaps more so, than in Amos' day.

So the new breeder must recognize, first, that cattle are kept on American farms to eat the feeds grown on these farms. He must set his head to breed the kind of cattle that will eat and eat more, and then convert what they do eat into the greatest number of pounds of beef possible. He must select his females and his herd bulls with this idea firmly fixed in his mind, that rate of gain relative to feed consumed is the most important measuring stick in any cattle regardless of breed, color, or sex.

Often you hear some breeder say "Yes, she's a great animal, but an awfully hard feeder." Any animal of this kind ought to be discarded. Easy-feeding, big middled cattle with hoggish appetites, always have been and always will be the most profitable cattle for farmers to keep. Easy feeding qualities, and rapid gains do not, however, come by accident — they're inherited, bred there. If you're selecting foundation stock, select the individuals with the background and the personality to eat and produce. Many characteristics of an animal which are conducive to feeding ability can be seen in an animal's outward appearance, such as a wide spring of rib, a broad chest, wide muzzle, thick even flesh, and a deep barrel, but the background of that

animal is just as important—the animal's pedigree,—his ancestry.

The next lesson I get from studying Amos Cruickshank's methods is—he bought the best. No one knows how much money and how much time he spent searching over all England and Scotland for cattle that filled his eye, cattle with features resembling his ideal. When he found one, he bought it, he pinched no pennies—he bought only the best. He paid enormous sums for bulls and females which in his opinion would do his herd some good. No one can question the fact that his policy was a sound one.

Here, I believe, the new breeder often makes the fatal mistake. "A cheap one will do," he says, "as long as she's registered." This attitude is generally poor judgment. It's perfectly true that the offspring from a scrawny, misshapen cow can be improved gradually by using top bulls, but the time involved in accomplishing such is so great that the economical thing to do is to start with the tops. I know a fellow, for example, who bought cattle about five years ago, when cattle were cheap, a group of foundation females, plain in pedigree and only fair in type, with the idea of improving them by using top bulls. Today, with cattle prices good, he is underselling his fellow breeders by about one-third. Why? His calves are an enormous improvement over the cows alright, his bull is tops, but when prospective buyers see the cow herd and read their pedigrees, they turn sour immediately, with the result that they either don't buy at all, or buy at greatly reduced prices. Purebred buyers are becoming educated and they must be assured that their purchases have the correct background.

So, my advice is—and it's not new—that the new breeder ought to start with the best, even though the initial cost may be greater. Cruickshank recognized this—no one should question the wisdom of such a policy. Purchase of top foundation animals does not necessarily mean the highest priced ones, for not always are the highest priced ones the best.

Next Cruickshank bought herd bulls with a particular improvement idea in mind, and then only the best. Furthermore he wasn't afraid to discard even a high priced bull if he thought that animal was doing him no good. For example, he searched for and bought bulls for what was considered fabulous prices in his day, and then discarded them because they produced calves that failed to meet his rigid standard. Consider his philosophy when the $2,000 Master Butterfly 2nd died shortly after his arrival at the Cruickshank farm—"It's the best

thing that could have happened, for he would have done mischief in the herd. He hasn't died a day too soon."

"The bull is half the herd" we hear. I say the bull is half the herd, unless he is a poor one, then he's more than half—he's the whole thing—the ruin of it. The new breeder should pay particular attention to his herd bull, buy only the best in individuality, with a pedigree and a type suited to his cows, and never let a few dollars separate him from a bull which fills the bill. And remember, I'm not arguing for fabulous prices, it's not always the highest priced bull which is the best. I'll give you an example. I know an Angus breeder who recently sold a group of females in an Eastern sale, good they were, for an average of about $1300, and all of them sired by a bull which cost him $150.

Amos Cruickshank never hesitated to discard a high-priced herd bull if he failed to produce. Too often I think, the breeder fails in this respect. He buys a high one, his pedigree is OK, and he looks like the McCoy, but as a breeder he's a bum. His calves are sorry, so sorry that even their mothers are ashamed of them. But of course he cost a lot of money, because he's bred in the purple; some breeders stick to this kind with the result that they're put back many years before the false alarm finally dies. It's true that it takes the hide off to have to discard a bull for which you paid a long price, but many times it has to be done.

Amos Cruickshank culled his herd rigidly. If cows failed to produce, as he thought they should, out they went. If calves failed to meet his idea of correct type, they found their way to the butcher.

With the new breeder, this mistake of failing to cull, is often glaring. Out he goes, and buys a high-priced group of foundation animals, and a bang-up bull, but he fails to recognize that any herd, regardless of the price, type or pedigree of breeding stock will have some culls. If you're a new breeder, please remember that some will come, unfit for future use as breeders. Don't keep them and force some poor sucker to take them, or have them hang around your own place simply because the pedigree reads well. I know a Hereford breeder who bought a supposedly well-bred bull, but about half the first and second crop of calves were line-backed, yet he keeps breeding the rascal because—"next time maybe they'll be OK," he says.

Cruickshank was not a plunger. He started on a poor, gutted farm as a tenant farmer when he was a mere lad. From that time until he died, he spent his time at only one job—breeding cattle.

He recognized the necessity of livestock to maintain soil fertility and improve eroded land. His aim was to breed the best cattle and keep the best farm in all Scotland. Like every breeder he had his jolts, but he never quit.

How different this reserved Scotchman was from some of our plungers who get in with the idea of buying in, cleaning up, and then clearing out. To you, Mr. New Breeder, my advice is this—get in to stay, or stay out. Successful cattle breeders must learn to take the lean years along with the fat ones. Sometimes demand and sales are good, sometimes not so hot, but the cattle business is sound, it's always been here, it will always stay. Soil fertility *and* crop production is dependent on returning plant food to the soil and as long as this is true, cattle and all other livestock will stay. So the cattle breeding business has all the future it ever had, but only for those who make it a profession, and who intend to stay.

Cruickshank's history teaches many other lessons such as patience, perseverance, tolerance, and business sense. No new breeder of today can hope to climax his accomplishments, but every new breeder can profit by his examples. His success demonstrates the wisdom of sound practices. Study Cruickshank before you start and follow his methods,—they couldn't have been wrong.

Chickens Have Taste!

Condensed from Ohio Farm Bureau News

Professor E. L. Dakan

Poultry Husbandry Department, Ohio State University

A HEN may not have teeth, but she knows what is good for her and what she likes, just the same! A baby chick may seem very stupid when it starts blindly picking at whatever looks bright and attractive, but a baby chick knows what is good for it, and acts accordingly.

How do I know the above statement is true, rather than just a statement of opinion? Well, I have tried it out here at Ohio State University. In a number of instances, we have put all the different ingredients of a feed before chickens, both young and old, and let them eat what they wanted, and, lo and behold, they eat just what is good for them.

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Suppose you have before these chickens, corn, wheat, oats, milk, fish meal, meat scraps, alfalfa hay, bran, middlings, cottonseed meal, salt, calcium, bone meal, cod liver oil, soybean oil meal, and perhaps a dozen more things which we could find in a well-stocked feed mill. Would the chickens be crazy about milk and not eat anything else? Would they take a fancy to fish meal and not eat any wheat? Would they kill themselves eating salt and not any calcium? They certainly would do none of these foolish and suicidal things! They eat just enough of each one to supply the demands for growth, maintenance, reproduction.

The Ontario Agricultural College, the University of Missouri and a number of other institutions have carried on similar experiments, and in every case the results have been the same. Chickens have taste! It may be puzzling to you and me, but the fact remains that they know what they are eating in terms of what is good for them.

There has been a mistaken notion among feed manufacturers, as well as among poultry raisers, that, since we were human beings and very smart, we could do a better job than the chickens in mixing feed. That is not true; we can do it to save ourselves labor. The only reason we have for mixing all the ingredients that go into a mash together is that by mixing them we save ourselves a lot of bother. We don't have to fill up 20 separate containers; we just fill up one, and by so doing we give the chicken 20 different nutrients, more or less.

There has grown up a notion, based upon experiences of our own eating, that since chickens do not have teeth we must grind all the feed very fine in order to save energy and in order to help the digestibility of the feed. What would happen if we put unground or very coarsely ground feed in front of a chicken in one container, and then in another we put all these ingredients finely ground? Or to put it another way, suppose we were to feed one lot of chicks very finely ground feed and another lot all very coarsely ground feed—both lots receiving exactly the same mixture, the only difference to be the texture of the feed.

We did that very thing here at the University this past autumn. The results of this simple trial were predictable because we already had observed that chickens prefer coarse mash, and since they prefer it, it was reasonable to believe, based on previous experience and experimentations, that it was good for them. The accompanying table gives you the results of this experiment.

Observe that it cost $9.80 more

FEEDING COSTS FOR DIFFERENT SIZE FEED

	Coarse	Pellets	Fine
Lbs. of feed per lb. of gain	4.04	4.21	4.30
Cost of feed per lb. of gain	$ .1333	$ .1431	$ .1419
Feed cost of 1000 lbs. of meat	133.30	143.10	141.90
Increased cost over coarse mash	.....	9.80	8.61

per 1000 pounds of meat produced to feed chickens pellets than it cost to feed them coarse mash. This included the cost of pelleting and the fact that the birds ate more of the pellets per pound of gain. Notice also that it cost $8.60 more per 1000 pounds of meat produced when fed a fine mash, than it did where the birds were fed a coarse mash. Now after all, $8.60 per 1000 pounds is a lot of money; suppose we multiply that by 1,000,000 pounds (that would not be too much, because 1,000,000 pounds of chicken is certainly being produced right now on fine mashes). If I can figure that out, the saving would be $8,600.00.

Suppose the farmers of Ohio produce around 50,000,000 chickens on an average weighing 3 pounds each—if we save even one-half of this $8.60 per 1000 pounds, it would represent a saving for the entire state in this one item of around $645,000.00.

By what right do I say take one-half—why not take the entire $8.60? Possibly one-half of our people are feeding a coarse mash, or a good many of them are not feeding a commercial mash at all; nor are they feeding a mash until the birds all weigh 3 pounds. So it would not be fair to assume that any such large saving would be made when applied to a large number of people.

It is a lot easier to make a coarse mash than a fine one. It is easier to grind, and it is easier to tell what is in a mash when it is coarsely ground. You don't suppose that is one reason why we have so many fine mashes, do you? I have been told by some of my friends who are in the commercial feed business, that the farmers object to a coarse mash. I am sure they are telling the truth; some farmers do object.

If any of you people who read this article object, I hope I have convinced you, and from now on you will be demanding a coarse mash. It produces more meat per pound of feed, and it gives you a measure of the ingredients in a mash.

Feeding Rabbits Under War Conditions

Condensed from Pacific Rural Press

George S. Templeton

Director U. S. Rabbit Experiment Station, Fontana, California

EXTENSIVE research work at the U. S. Rabbit Experiment Station at Fontana, California, has demonstrated that for optimum development and production, rabbits' rations should consist of one or more cereal grains (oats, wheat, buckwheat, barley, rye, and the grain sorghums), a good quality, leafy, legume hay (alfalfa, clover, sweet clover, vetch, lespedeza, soybean, cowpeas, and peanut), a plant protein supplement (soybean, peanut, or linseed) in the meal, pea-size cake, or pelleted form, white salt and water. The addition of minerals and vitamins have not added to the efficiency of the rations.

The ration composed of the cereal grains, a plant protein supplement, and good quality legume hay, and white salt can be fed to the rabbits in the natural or pelleted form.

The ration, whether fed in its natural or pelleted form, can be improved by feeding regularly small quantities of fresh, sound, succulent, green feed or root crops when available and not too costly. This maintains a better physical tone in the breeding herd than is possible without these additions.

Protein is an extremely important item in making up rations of rabbits for optimum production. The adding of the proper amount of these supplements—soybean, peanut, linseed—in the meal, pea-size cake, or pelleted form, to a grain-hay ration will increase the gain in live weight of young rabbits from 13 to 20 per cent and will make a saving of 20 to 25 per cent in the feed bill by producing larger gains with less feed. However, when these proteins are simply not available on the market, the best the rabbit breeder can do is to feed the grain and hay without the protein and be satisfied with slower gains.

The cereal grains have very much the same feeding value and when they are of the same quality and a plant protein supplement is available for balancing the ration, it makes little difference to

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the rabbit as to whether one or more of these grains are included in the ration, but when it is impossible to obtain the plant protein supplements, it becomes necessary to feed at least two different kinds of grains—three varieties would be better—for by feeding a variety of grains, a better balance of protein is insured as the different grains have different amino acids.

It is possible for the breeder to add materially to the protein content of the ration by wisely selecting his roughages. Rapidly growing plants are rich in protein and these succulent crops, properly fed in limited quantities, will improve the ration. It is all-important that the legume hays be leafy and of fine stem, for alfalfa hay with coarse stems may contain only 9.6 per cent of digestible protein where if the same crop had been cut before it had started to bloom, it would have produced a hay containing as much as 14.2 per cent digestible protein.

As complicated as this wartime feeding problem may appear to be to the individual breeder who has not been accustomed to working out his own feeding program, it is up to him to utilize to the best advantage the feeds that are available and produce all of the rabbit meat that he can under the conditions. If one is inclined to question as to whether or not this can be done, let him take heart in the fact that the British breeders have been doing so for a long time. They have been rationed on the basis of seven pounds of bran per doe, per quarter, the balance of the feed being made up of greens, root crops, and hay supplemented by kitchen scraps.

While this feeding program will not produce the rapid gains to which the American breeder has been accustomed, 250,000 does in England are giving a splendid account of themselves and furnishing their owners a good quality meat that is making its contribution to an Allied Victory.

ANSWERS TO QUESTIONNAIRE ON PAGE 70

1. Coral Snake, Copperhead, Water Moccasin and Rattlesnake.

2. B. is correct.

3. A. is correct. The Gila Monster.

4. True. Poison-ivy may affect the skin in winter if the fruit or twigs are handled.

5. Injection of a powerful acid. B. is correct.

6. Jack-in-the-pulpit. Larkspur, Wild Cherry and Jimson-Weed are poisonous.

7. No. Rocky Mountain Spotted Fever is also transmissible to man by the common dog tick. (*Dermacentor variabilis*).

8. According to the National Safety Council, hot coffee or tea, as much as patient can be persuaded to take. B. is correct. Heat exhaustion is often confused with sunstroke.

9. True.

10. B. is correct—black shiny with red markings on abdomen.

11. Quail, Red Fox, Chicken and Muskrat. These are among some 20 kinds of Wildlife which are known as susceptible to tularemia.

12. Both are correct. Acid is secreted within the hair and released when the point is broken off.

13. False. After proper treatment, the quills are not so penetrative. They penetrate just as easily, however, after the animal dies as before.

14. Beefsteak or Liver Fungus, Morel, Oyster Mushroom, Coral Fungus and Meadow Toadstool.

15. Bite. It does not sting.

16. Fall. In the mating season.

17. No.

18. Flea. B. is correct. The infected rat is most often the "host" of the flea, but if rat dies, flea finds a new host, often man and bites with infected mouth.

19. True. They have been known to bite sleeping campers and give hydrophobia. The little spotted skunks of the southwest are often called "hydrophobia skunks."

20. Has flowers in the form of dull purple bells produced single, and big tempting cherry-like black berries. A. and D. are correct.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Farm Shop Practice—By Mack M. Jones, M.S., Prof. Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $2.90.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Association. $2.50.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Poultry Management—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Sheep—By Levi Jackson Horlacher, Prof. of Animal Husbandry, Univ. of Kentucky. The Interstate Printers and Publishers. $2.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Soybeans—Gold from the Soil — By Edward Jerome Dies. The Macmillan Co. $1.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

BOOK NOTES

America's Garden Book—By Louise Bush-Brown, Director of the School of Horticulture, and James Bush-Brown, Landscape Architect.
This is a refreshingly practical and comprehensive volume. It tells the whole story of garden processes in smallest possible compass, without being elementary or incomplete. The thirty-four chapters present all possible topics in gardening, and include such timely subjects as Soil and Soil Improvement, Lawns, The Home Fruit Garden, The Home Vegetable Garden, Coldframes and Hotbeds, House Plants, Diseases and Insect Pests, Ornamental and Woodland Gardens.
Publishers: Charles Scribner's Sons, 1939. 1222 pages. 200 photographs and diagrams. $3.50.

A Living from Bees—By Frank C. Pellett, Field Editor of the American Bee Journal.
As the title suggests this book is designed to explain how a living can be made from bees. The fundamentals of honey production are explained and the reasons given for each necessary manipulation. Conditions under which beekeeping is practical as an exclusive business and when it is better to be followed as a sideline are discussed at length.
Publishers: Orange Judd Publishing Co., Inc. (1943). 320 pages. $2.00.

The Home Veterinarian's Handbook—E. T. Baker, Practicing Veterinarian at Moscow, Idaho, contributor to farm journals and newspapers, on the Staff of The Idaho Farmer.
This book is a guide in the handling of emergency situations regarding farm animals and poultry. It covers the handling of many serious ailments and suggests what not to do until expert assistance can be obtained. Subjects discussed are in alphabetical order for quick reference.
Publishers: The Macmillan Company (1943). 191 pages. 54 photographs. $2.50.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

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Ovid Butler, executive secretary of The American Forestry Association, is editor of **American Forests**. He was formerly associate director of the United States Forest Products Laboratory at Madison, Wisconsin.

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